US00D463982S

(12) United States Design Patent

Speelman

(10) Patent No.: US D463,982 S
(45) Date of Patent: ** Oct. 8, 2002

(54) **CONTAINER**

(75) Inventor: **Robert Speelman**, Findlay, OH (US)

(73) Assignee: **Silgan Plastics Corporation**, Triadelphia, WV (US)

(**) Term: **14 Years**

(21) Appl. No.: **29/146,737**

(22) Filed: **Aug. 15, 2001**

(51) **LOC (7) Cl.** **09-01**
(52) **U.S. Cl.** **D9/539**; D9/500; D9/549
(58) **Field of Search** ..... D9/300, 501, 502, D9/503, 504, 537, 549, 516, 520, 530, 539, 558, 574; 215/200, 316, 354, 356; 221/312 R; 222/206, 465.1, 470, 519

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Primary Examiner—Ted Shooman
Assistant Examiner—Daniel Bui

(57) **CLAIM**

The ornamental design for a container, as shown and described.

DESCRIPTION

Commonly owned, concurrently filed utility patent application Ser. No. 09/930,079 entitled "A package including a container with a wide-mouth spout and enclosure sealing the spout".

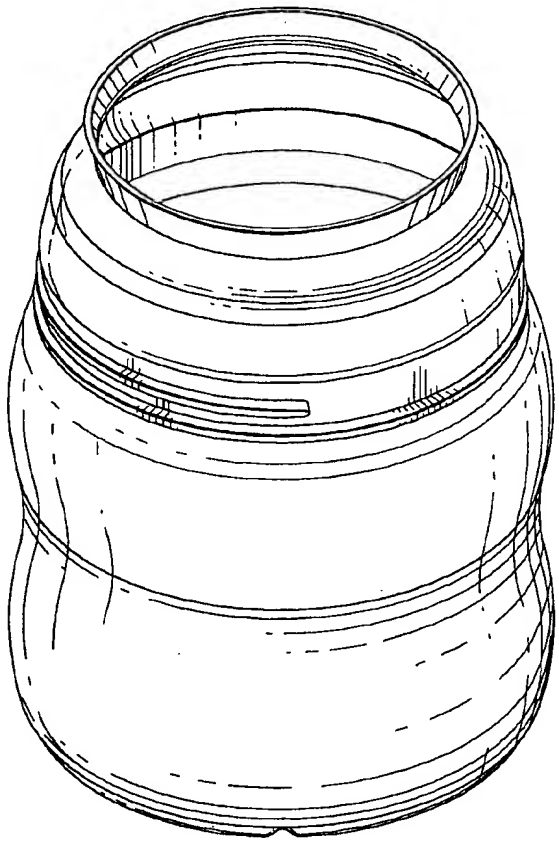
FIG. **1** is a perspective view of the container showing my new design;

FIG. **2** is an elevation view of the container taken from the side opposite that shown in FIG. 1;

FIG. **3** is a top plan view of the container; and,

FIG. **4** is a bottom plan view of the container.

1 Claim, 3 Drawing Sheets



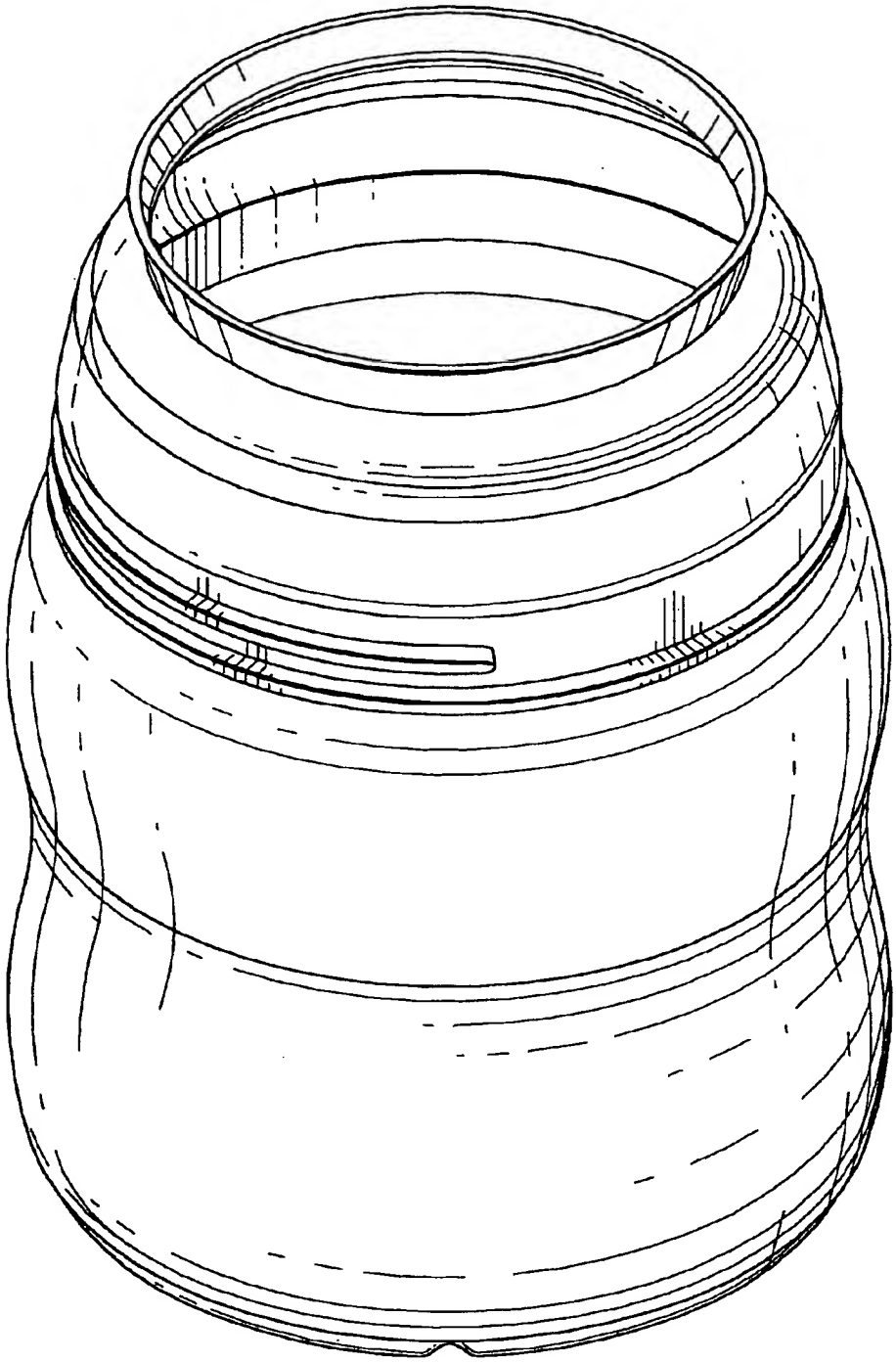


FIG. 1

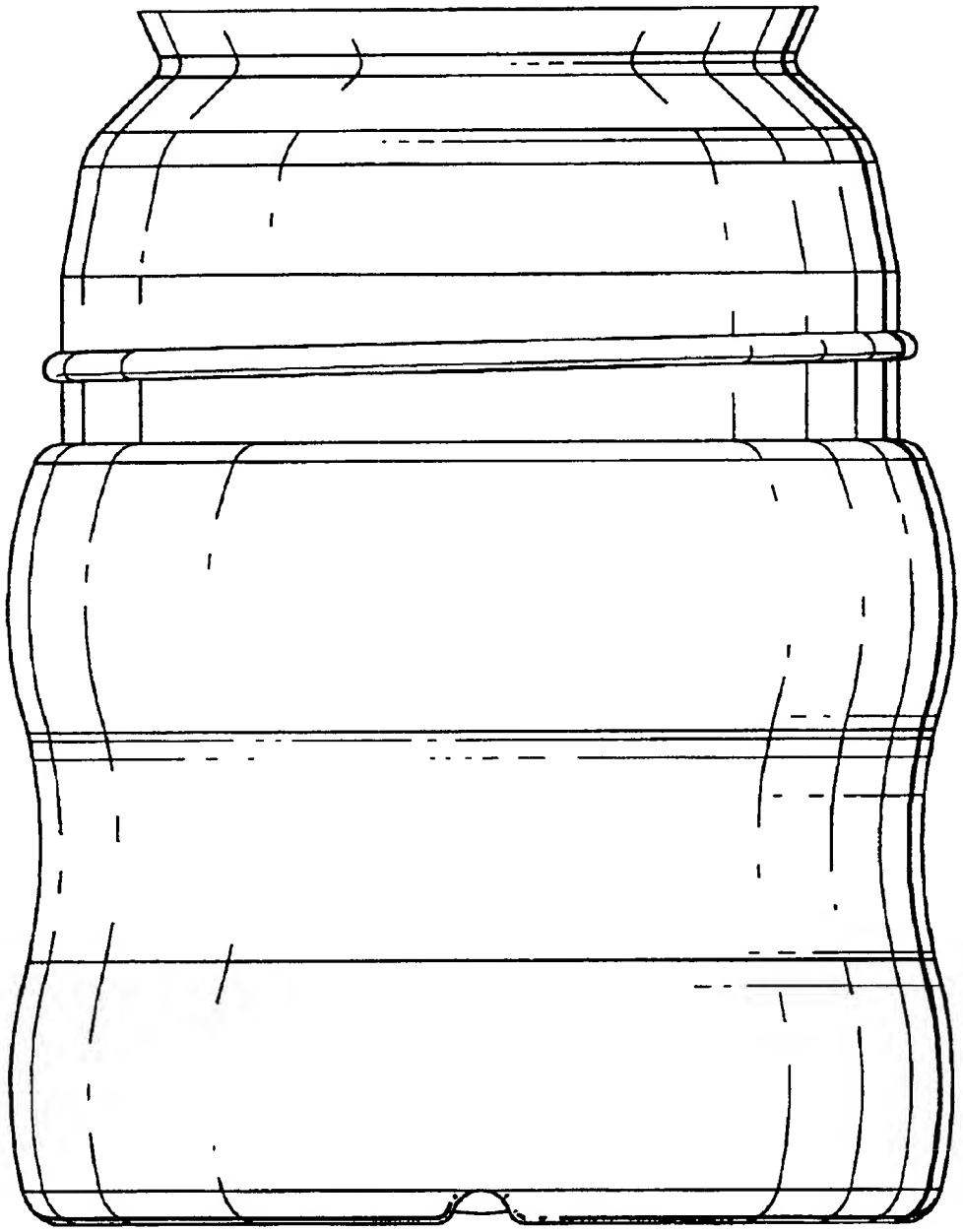


FIG.2

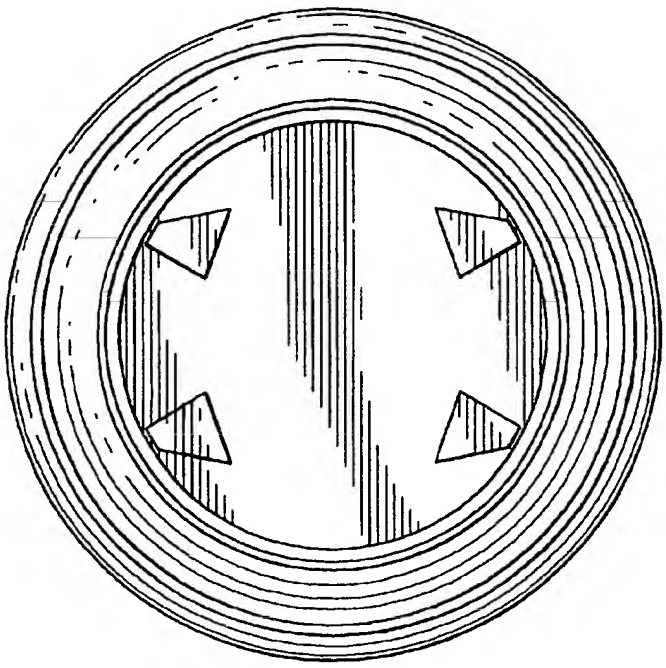


FIG. 3

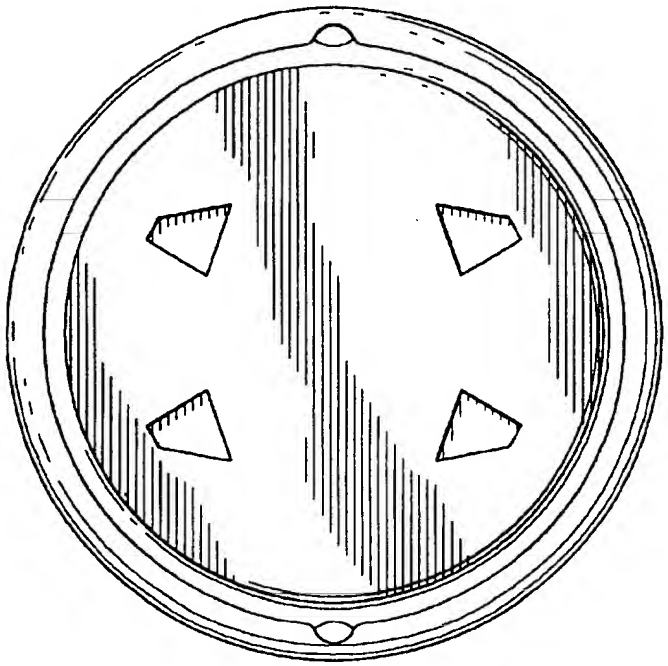


FIG. 4

US005964362A

United States Patent [19]

Sandor et al.

[11] Patent Number: 5,964,362

[45] Date of Patent: *Oct. 12, 1999

[54] **BLOW MOLDED CONTAINER STRUCTURE, CAP THEREFORE AND METHOD OF FORMING SAID NECK**

[75] Inventors: **Laszlo G. Sandor**, Fremont; **Daniel Luch**, Morgan Hill; **Richard E. Repp**, San Jose, all of Calif.

[73] Assignee: **Portola Packaging, Inc.**, San Jose, Calif.

[*] Notice: This patent is subject to a terminal disclaimer.

[21] Appl. No.: **08/847,928**

[22] Filed: **Apr. 28, 1997**

Related U.S. Application Data

[63] Continuation of application No. 08/385,808, Feb. 9, 1995, abandoned.

[51] **Int. Cl.**[6] **B65D 41/48**; B29C 25/00

[52] **U.S. Cl.** **215/43**; 215/45; 215/344; 264/536

[58] **Field of Search** 215/43–45, 256, 215/252, 343, 344, 354; 206/508, 509; 264/536, 533, 531, 163; 425/525, 527, 289, 292, 296, 298, 308, 310

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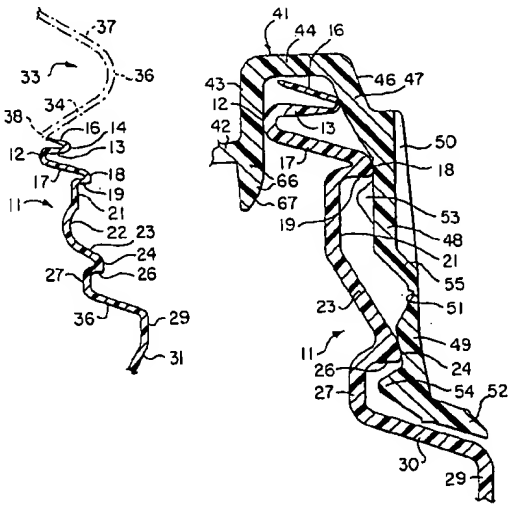
Primary Examiner—Stephen K. Cronin
Assistant Examiner—Nathan Newhouse
Attorney, Agent, or Firm—Julian Caplan; Flehr Hohbach Test; Albritton & Herbert LLP

[57] **ABSTRACT**

The neck of a container has a smooth seal surface engaged by the inner skirt or plug of a cap. Such surface is free of trim and parting line flaws which are characteristic of blow-molded jars because the surface is formed in such a way that the seal surface is not in contact with mold parting lines and further the trim of the neck (excess plastic) is located away from the sealing surface. In one form of the disclosure, above the sealing surface the neck wall slants outward and then bends upward-inward in a short, tapered stretch about 18° to the horizontal which engages the underside of the cap disk to compress against the disk or a liner or foil. In another form of the invention, above the seal surface the neck extends outward and the upward and then inward in a flange which is trimmed along a line which has a circumference no less than the circumference of the seal surface. The exterior of the neck is formed with shoulders which engage over locking beads on the interior of the outer skirt of the cap.

22 Claims, 6 Drawing Sheets



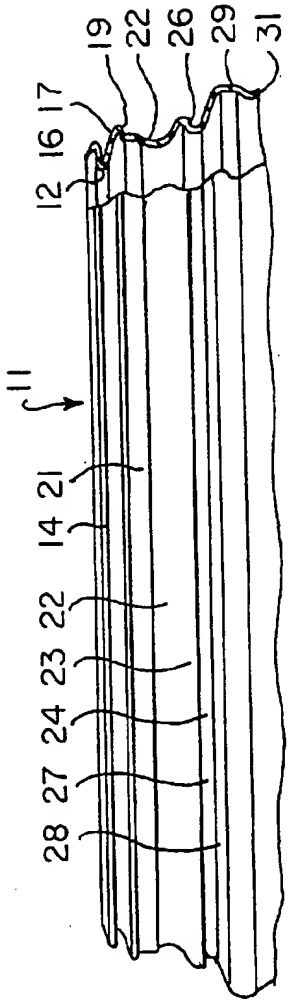


FIG. 1

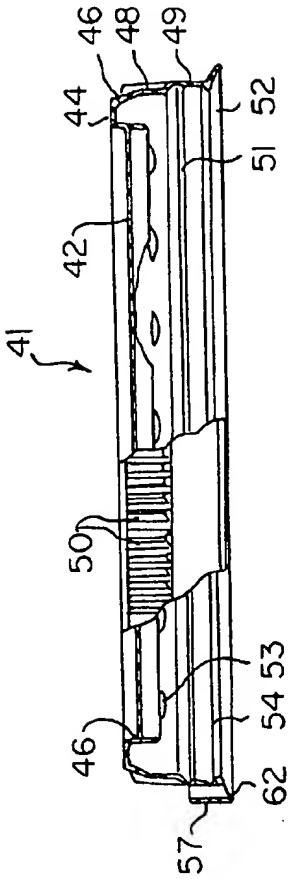


FIG.3

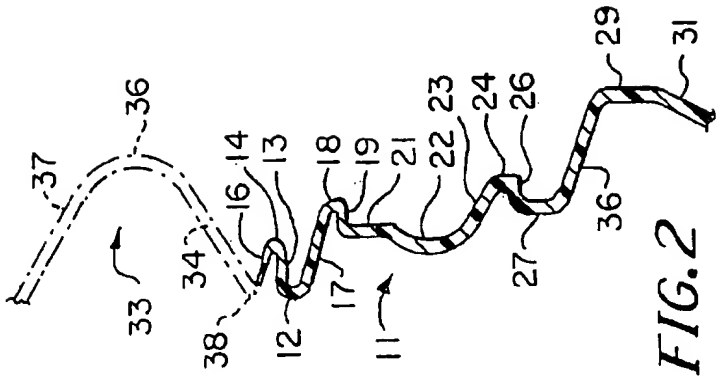


FIG.2

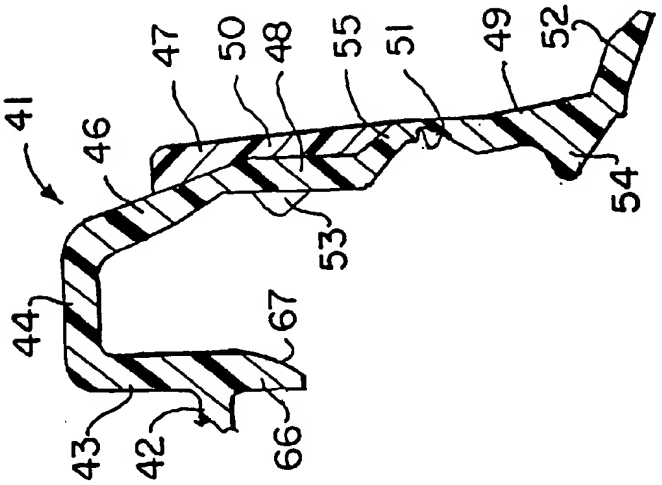


FIG.4

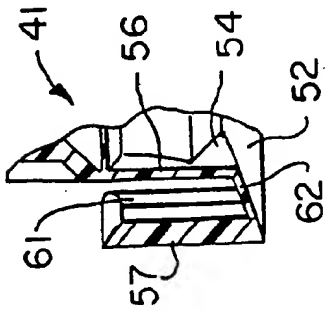


FIG.6

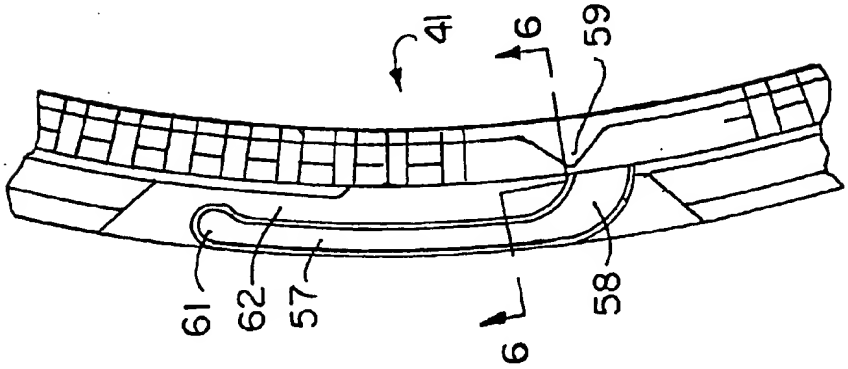


FIG.5

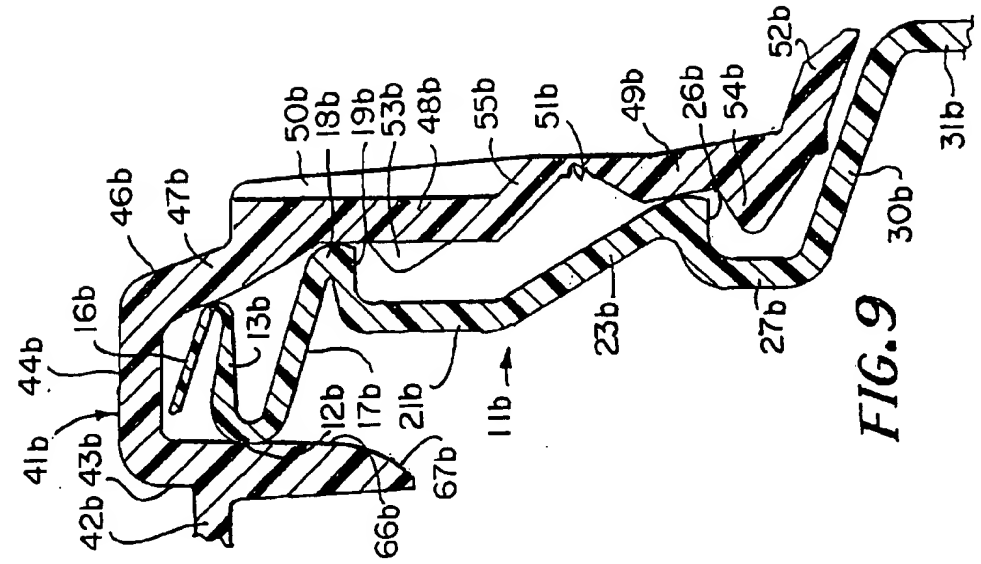


FIG. 9

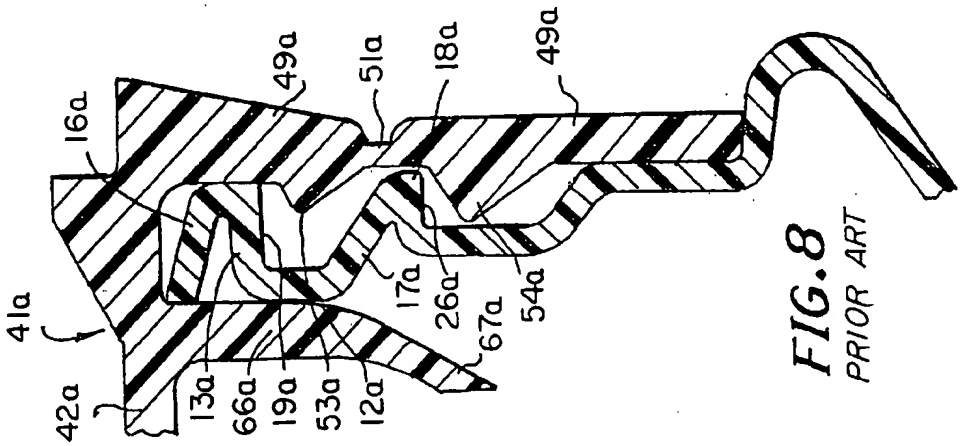


FIG. 8
PRIOR ART

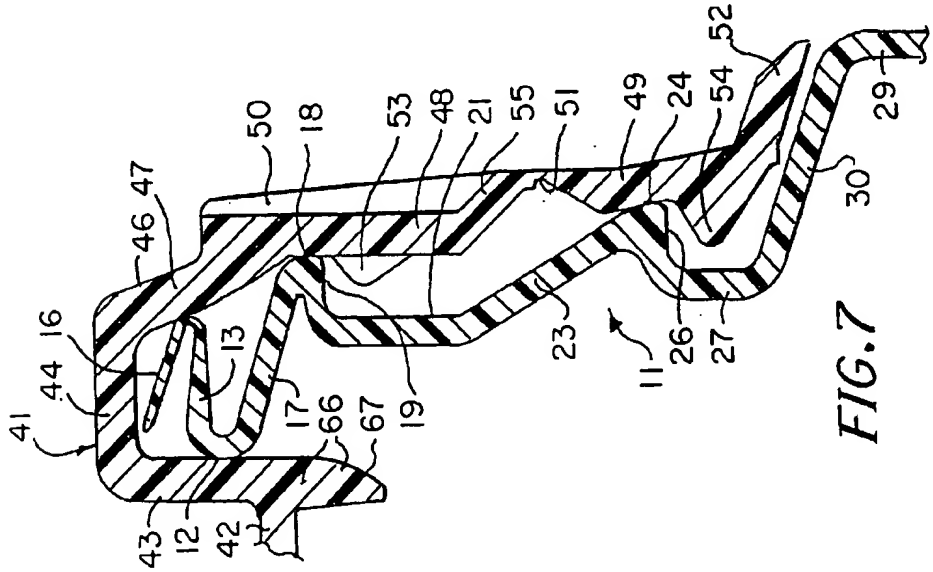
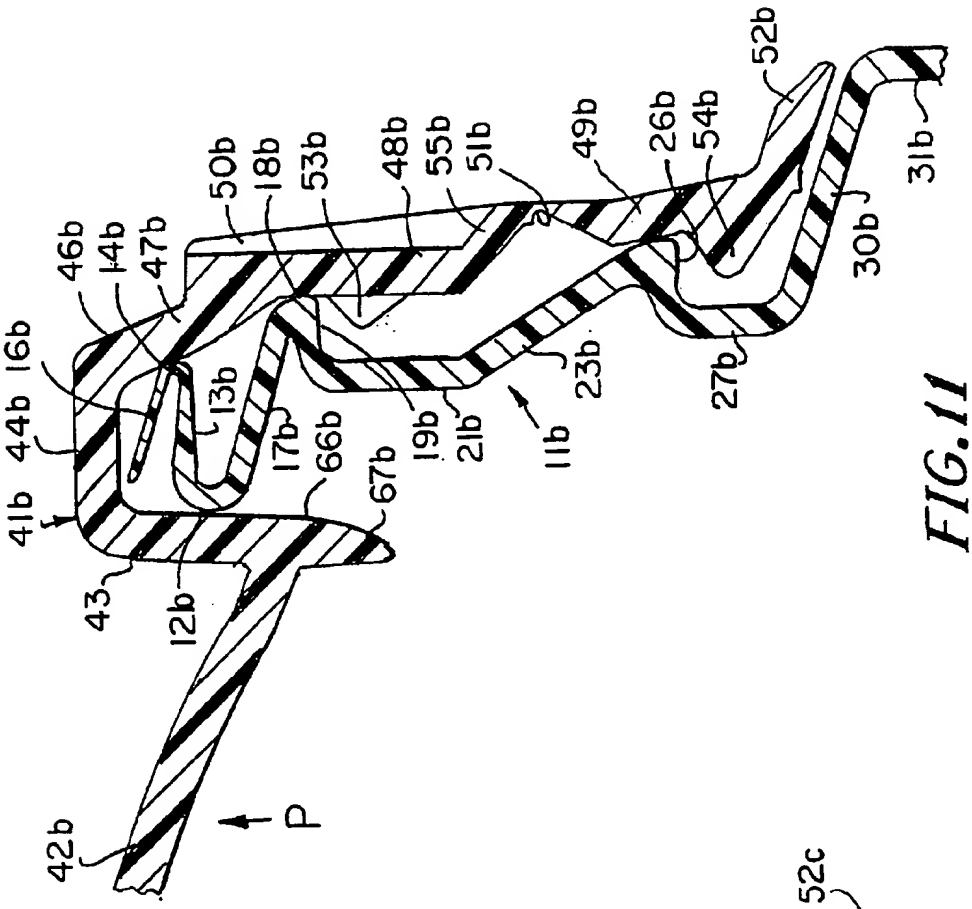


FIG. 7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13b
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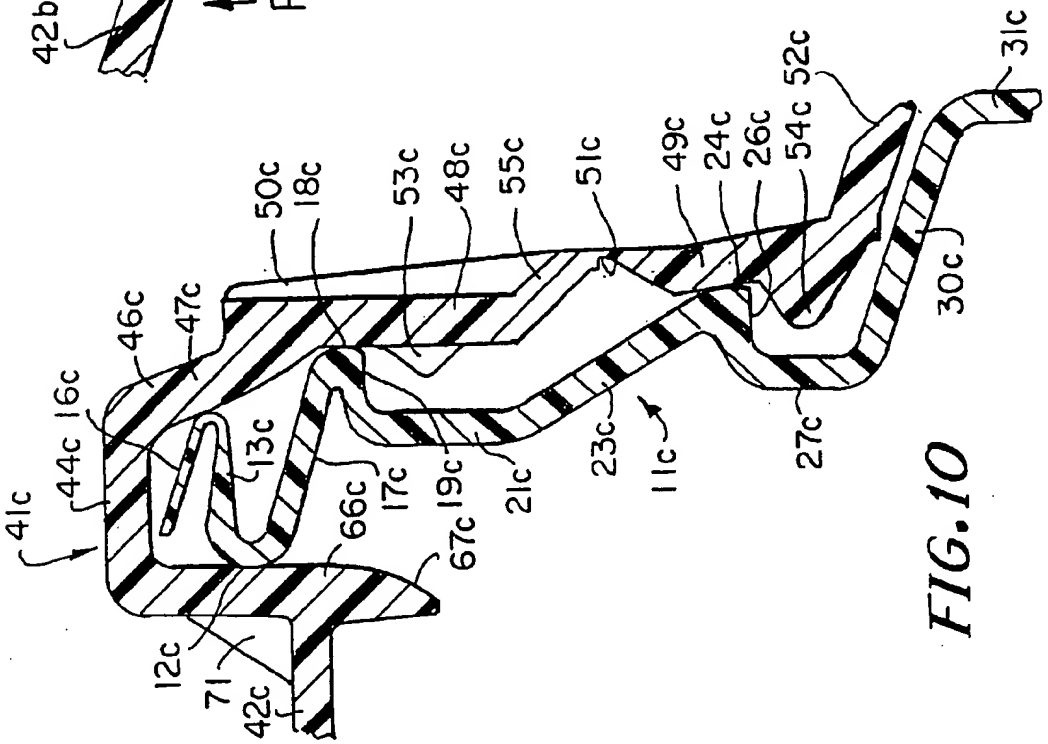
66b
19b
21b
11b
23b
27b
41b
67b
43
12b
42b
P

FIG. 11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30c
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16c
44c
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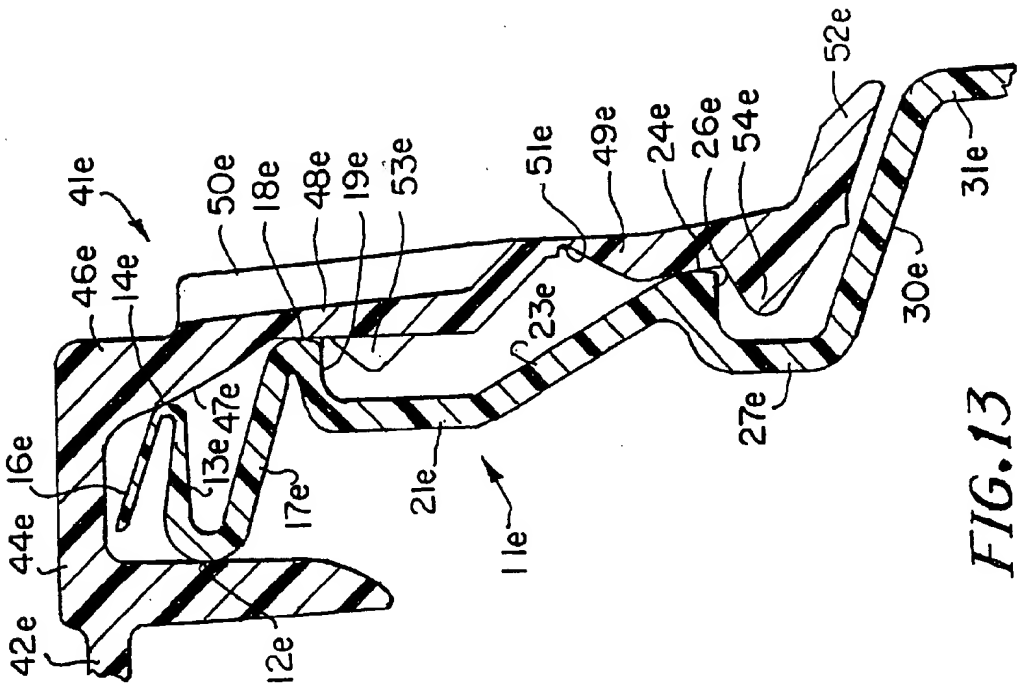
17c
66c
19c
21c
23c
11c
27c
41c
67c
12c
71
42c

FIG. 10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46e
14e
50e
18e
48e
19e
53e
51e
49e
24e
26e
54e
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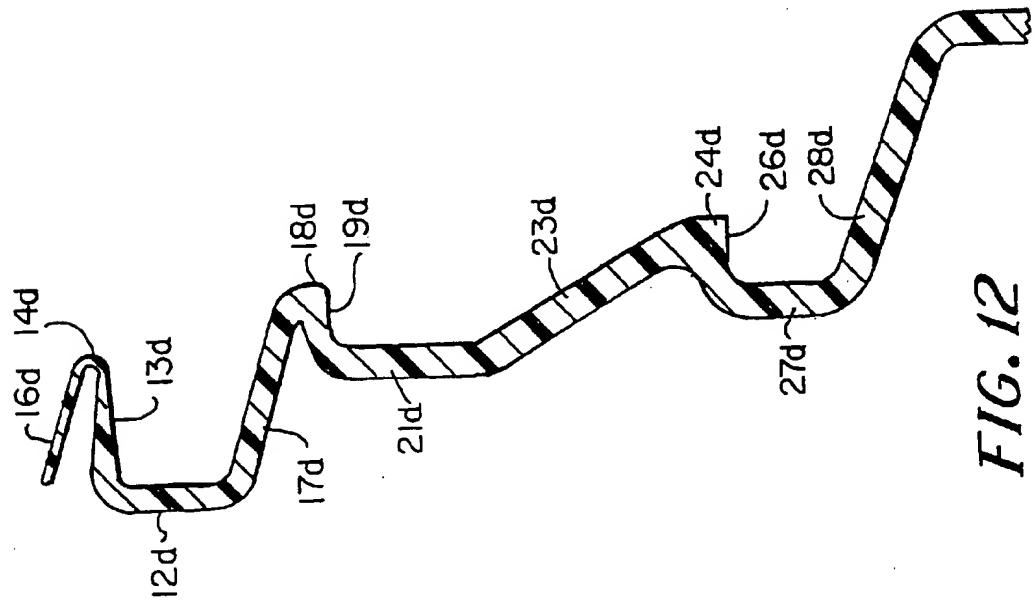
21e
11e
27e
44e
42e
12e

FIG. 13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24d
26d
28d
17d
21d
27d
12d

FIG. 12

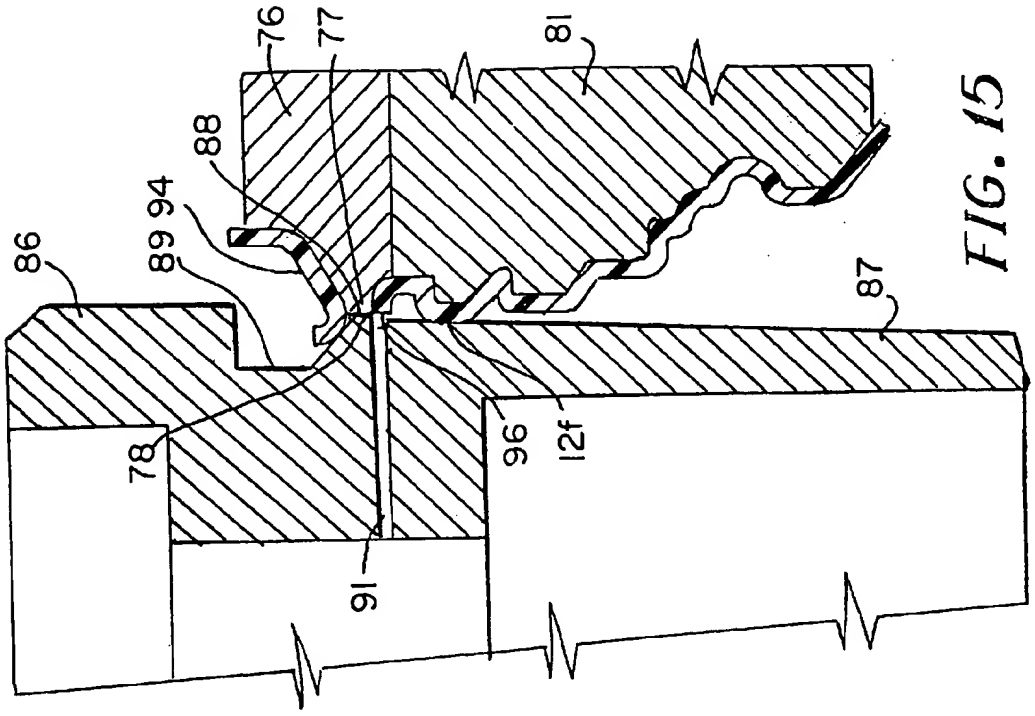
76
77
81
88
89 94
86
87
78
96
12f
91

FIG. 15

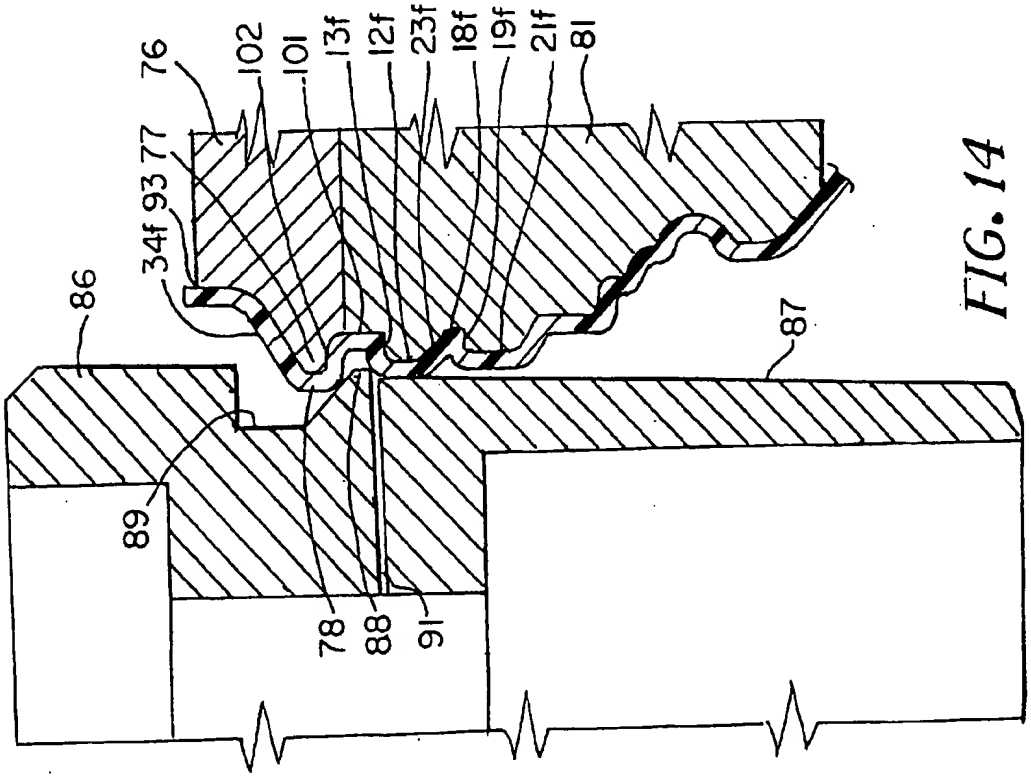
76
102
101
13f
12f
23f
18f
19f
21f
81
34f 93 77
86
87
89
78
88
91

FIG. 14

BLOW MOLDED CONTAINER STRUCTURE, CAP THEREFORE AND METHOD OF FORMING SAID NECK

CROSS REFERENCE TO RELATED APPLICATIONS

This application is a File Wrapper Continuation of U.S. application Ser. No. 08/385,808, filed Feb. 9, 1995 now abandoned.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a new and improved blow molded neck construction for bottle or other container, a cap therefor and method of forming said neck. More particularly, it relates to the neck finish for a blow molded plastic bottle characterized by the fact that when used with a cap having a plug (i.e., inner skirt) the surface of the neck against which the plug seals is a seal surface without parting lines and a portion above the seal surface comprises an inward directed thin flexible flange.

2. Description of Related Art

An exemplar of the prior art is U.S. Pat. No. 4,691,834 which shows an upward inward directed flexible flange sealing against the corner of the intersection of the outer wall of the plug and the underside of the top of the cap. The neck sealing surface is, inherently, somewhat uneven and ragged since the neck is cut or sheared adjacent this sealing surface. In the present invention, however, the neck is trimmed at the edge of the upper flexible flange but such edge is not the portion of the neck which seals against the cap plug.

The references cited against said U.S. Pat. No. 4,691,834 are likewise distinguishable.

U.S. Pat. Nos. 4,625,876 and 4,798,301 show curved plug contacting surfaces but these are of substantially the same diameters as the inner edge of the flanges which engage the underside of the top of the cap.

SUMMARY OF THE INVENTION

The bottle of the present invention is blow molded in a split mold by techniques well known in the art. The surfaces of the mold which define the neck structure cause the neck shape hereinafter described. An upper portion of the parison above the neck is trimmed or cut from the neck according to conventional practice (e.g. pull-up trim, spin trim, etc.) The circle at which the upper portion of the parison is severed from the neck is the inner edge of an inward upward slanted flange. The other end of the flange merges into a curved surface which extends inward a greater distance than the aforesaid edge to merge with an internal sealing surface of lesser diameter than said edge. The neck structure above the neck sealing surface has rapidly changing diameters which form a flexible membrane due to parison stretching in the blow molding process. Below the sealing surface the exterior of the neck structure slants downward outward to a horizontal shoulder and then extends downwardly and then outwardly to a second or lower shoulder.

The cap with which the neck is used has a top having a depending central plug or inner skirt, the outer surface of which seals tightly against the sealing surface of the neck. The cap also has an outer skirt having internal sealing beads which engage the upper and lower shoulders of the neck to hold the cap in place. The lower portion of the outer cap skirt may be removed by the user engaging and pulling a pull tab which causes the lower part of the skirt to disengage at a

circumferential score line. Until such lower skirt is removed, the cap and neck are tamper-evident.

The accompanying drawings, which are incorporated in and form a part of this specification, illustrate embodiments of the invention and, together with the description, serve to explain the principles of the invention:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a side elevational view of a neck portion of a jar in accordance with the present invention partially broken away to reveal structure.

FIG. **2** is an enlarged sectional view of the neck structure and a portion of a blow dome superimposed thereabove.

FIG. **3** is a side elevational view of a cap with which the neck is used, the cap being partially broken away in section to reveal internal construction.

FIG. **4** is an enlarged sectional view of a portion of FIG. **3**.

FIG. **5** is a further enlarged fragmentary bottom plan view of a portion of the cap showing a top view of the pull tab.

FIG. **6** is a fragmentary sectional view taken substantially along the line **6—6** of FIG. **5**.

FIG. **7** is an enlarged sectional view showing schematically the seating of the cap on the neck.

FIG. **8** is a view similar to FIG. **7** of a prior art device.

FIG. **9** is a view similar to FIG. **7** of a modification.

FIG. **10** is a view similar to FIG. **7** of another modification.

FIG. **11** is a view similar to FIG. **7** showing possible distortion of the cap top if pressure is applied to the container.

FIG. **12** is an enlarged view of the neck structure showing an alternate seal area.

FIG. **13** is a view similar to FIGS. **9** and **10** showing modified sealing surface positions.

FIG. **14** is a vertical sectional view through a modified container neck and portions of the mold and blow pin forming same.

FIG. **15** is a view of similar to FIG. **14**, showing the blow pin in raised position.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Reference will now be made in detail to the preferred embodiments of the invention, examples of which are illustrated in the accompanying drawings. While the invention will be described in conjunction with the preferred embodiments, it will be understood that they are not intended to limit the invention to those embodiments. On the contrary, the invention is intended to cover alternatives, modifications and equivalents, which may be included within the spirit and scope of the invention as defined by the appended claims.

Neck **11** is formed on a thin-walled jar or other container and has a curved primary seal surface **12** which is very smooth and is distinguished by the absence of parting lines inasmuch as it is formed by air pressure or other mechanical means during the blow molding process and is not formed by the mold halves and thus does not have a mold parting line formed therein. As shown in FIG. **12**, seal surface **12** may be vertical or it may be curved, as shown in FIG. **2**. Further, the primary sealing surface has minimal ovality, by reason of the way it is formed. Above surface **12** the neck structure

extends outwardly in a outward stretch **13** which terminates in an upward bend **14**. Above bend **14** is a thin, tapered upward-inward extending flange **16**, the inner edge of which is of greater diameter than the diameter of surface **12**. Below surface **12** the neck extends downwardly-outwardly in a slanted stretch **17** which terminates in a short vertical stretch **18**, there being an inward directed substantially horizontal upper shoulder **19** below surface **18**. Vertical stretch **21** extends downwardly from the inner edge of shoulder **19** terminating in an inwardly curved portion **22** which merges with an outward downward stretch **23**. An approximately vertical short surface **24** (of greater diameter than surface **18**) terminates in a second or lower horizontal inward directed shoulder **26**. Vertical stretch **27** depends from the inner edge of shoulder **26**, merging with an outward stretch **30** which merges with an outward downward stretch **29**. The lower end of stretch **29** merges with an inward downward stretch **31**.

In accordance with one form of standard blow molding practice, a parison of the plastic material from which the container is to be formed is deposited in the split mold. Air is blown into the parison to expand it to fill the mold. In one form of the present invention, the mold has inserts which shape the finish of the neck of the container heretofore described and above these neck inserts the mold widens out to establish what is known as a blow dome of excess material. The blow dome is severed from the neck finish by well-known means. In accordance with the present invention, as distinguished from prior neck finishes, the blow mold is severed at the inner edge of flange **16**. Severing the edge of the neck from the blow dome may cause a rough surface. One of the advantages of the present invention is that the edge at which the blow dome is severed is not the primary sealing surface **12**. Thus directing attention to FIG. **2**, blow dome **33** has an outward upward slanted stretch **34** merging into a curved stretch **36** which has an inward slanted stretch **37**. The cut line **38** is a circle wherein the stretch **34** is severed from the inner edge of flange **16**. By reason of the almost 180° bend **14**, and the rapid diameter changes within a relatively short vertical distance flange **16** is thin and flexible.

Another way to achieve the neck structure of the present invention is to employ what is commonly referred to as "pull-up" trim. In this case the cut line **38** is achieved by having a close diametrical fitting of a blow pin positioned internally within the parison and sets of shear steels mounted on the split mold. Diameters of the blow pin are typically 0.001 inch to 0.004 inch smaller than that diameter defined by the shear steels in closed position. After blowing of the neck and container, the portion of the parison above cut line **38** is severed from the neck portion below cut line **38** by upward movement of the blow pin relative to the shear steels.

It will be understood that the type plastic used to mold neck **11** may be any suitable relatively hard plastic such as polyethylene.

One form of closure or cap used with the present invention is shown in FIGS. **3–7**. The closure of FIGS. **3–7** comprises an indented circular top **42** having a short peripheral cylindrical upward extending member **43** from which extends outwardly a stack rim **44**. The outer edge of rim **44** has a depending downward stretch **46** which merges into vertical, substantially cylindrical upper outer skirt **48**. The lower end of skirt **48** merges into an outward downward slanted stretch **55**. Below stretch **55** is the lower substantially cylindrical outer skirt **49**. An internal scoreline **51** separates stretch **55** from lower skirt **49**. Below lower skirt **49** the cap has an outward downward slanted flange **52** which, for practical purposes, rests against the surface **30** of neck **11**. Interrupted upper inner bead sections **53** engage under the shoulder **19**. Lower inner bead **54** at the lower end of skirt portion **49** engages under the shoulder **26**. When the cap is attached, the beads **53** and **54** prevent cap **41** from being removed from neck **11**. In order to enable the user to grip cap **41**, ribs **50** extend outwardly from member **48** merging with the outer surface of lower skirt portion **49** as best shown in FIG. **7**. Ribs **50** also impart columnar strength to the closure to transfer vertical force and prevent closure collapse during axial application of the closure to the finish.

At one portion of the circumference of lower skirt **49** (as best shown in FIGS. **5** and **6**), spaced downwardly therefrom is a horizontal pull tab **57** having a curved connection **58** to skirt **49**. The interior of skirt **49** is formed with a notch **59** where tab **57** joins lower skirt **49**. Notch **59** forms a vertical line of weakness through skirt **49**. Enlargement **61** is formed on the distal edge of pull tab **57**. The flanged **52** is formed thinner than the rest of flange **52** in the thin area **62** adjacent tab **57**.

As a downward extension of cylindrical member **43** the cap **41** is formed with a depending skirt extension **66**, the lower inner edge of which is formed with a radius **67**. The inner surface of member **43** seals against primary seal surface **12**. The vertical position of cap top **42** can be adjusted to provide for compression of surface **12** against the adjacent surface of member **43**.

Directing attention to FIG. **7** it will be seen that the surface **12** is the primary sealing surface against the member **43**. As has been noted, the surface **12** is very smooth and hence forms a very effective seal against the member **43**.

When the cap is applied, the beads **53** and **54** lock under the shoulders **19** and **26** to prevent removal of the cap and hence are tamper evidencing. When the user wishes to open the container, the user grips the enlargement **61** and bends the pull tab **57** outwardly and then pulls circumferentially, tearing the lower skirt **49** from the upper cap portion. The user may then grip under the surface **55** which, as shown in FIG. **7**, is spaced from the bottle finish by a considerable gap, and pull upwardly causing the interrupted upper bead segments **53** to disengage from shoulder **19** so that the cap may be removed. The ribs **50** rigidify the upper portion of the cap to allow the forces necessary to push the cap onto the bottle from causing the cap to buckle. The portion of the cap above line **51** constitutes a reclosure cap and may be pressed back on the neck after portions of the contents of the jar are dispensed as frequently as required.

Comparison of FIG. **7** with prior art structure shown in FIG. **8** shows that in the present invention the very smooth surface **12** causes a tight seal against the exterior of member **43** and the flange **16** need not seal at all, whereas in the prior art the cut inner edge of the flange is a primary seal. The primary seal surface **12** has minimum deviation from ovality as compared to FIG. **8** where the primary seal is coincident with a trim surface. Bottles of this type of this invention and the prior art were molded. The ovality of the two types was measured. The unexpected result of these experiments was that the current invention produced a significantly more circular primary seal area. Refer to Table A. for tabulated results. The stretch occurring on both sides of the primary seal **12** is primarily contributing to the superior ovality and differentiate it from prior art.

TABLE A

STD BOTTLE STYLE				PRESENT INVENTION			
Run A	Run B	Run C	Run D	Run A	Run B	Run C	Run D
0.055	0.020	0.048	0.028	0.024	0.058	0.002	0.015
0.053	0.002	0.056	0.015	0.006	0.010	0.106	0.030
0.062	0.000	0.044	0.010	0.017	0.002	0.013	0.010
0.043	0.010	0.058	0.003	0.016	0.004	0.005	0.027
0.058	0.029	0.025	0.009	0.014	0.013	0.005	0.034
0.064	0.016	0.055	0.003	0.011	0.060	0.017	0.017
0.011	0.005	0.059	0.002	0.004		0.003	0.017
0.019	0.013	0.049	0.005	0.007			
0.042	0.006	0.045	0.002	0.013			
	Average 0.028				Average 0.016		

If the contents of the container are non-viscous (e.g., brine-packed pickles) or if the walls of the container are easily squeezed during transportation or handling, top **42** may be subjected to upward pressure causing it to become "domed" (outwardly convex). Such action may cause the inner skirt member **43** to pivot away from curved primary seal **12**, resulting in leakage. This effect is illustrated in FIG. **11**.

FIG. **9** shows one remedy for such leakage. Contrasting FIG. **9** with FIG. **7** it will be seen that top **42***b* is raised relative to stack rim **44***b* and that the contact of surface **12***b* with inner skirt member **43***b* is more closely opposite top **42***b*. In addition, reducing the vertical spacing between top **42***b* and stack rim **44***b* reduces the lever arm and corresponding mechanical advantage of the inward force component generated by internal pressure. Hence doming of top **42***b* does not result in pivoting of skirt **66***b* out of sealing contact with surface **12***b*. FIG. **11** shows how pressure applied to the container (as by squeezing the side wall) may cause top **42***b* to bow upward, pulling plug **66***b* away from such surface **12***b*.

FIG. **10** shows another remedy for leakage due to doming of surface **42***c*. A plurality of angularly spaced, substantially radially gussets **71** are formed at the intersection of top **42***c* and cylindrical member **43***c*. Gussets **71** prevent member **43***c* from pivoting away from surface **12***c*. A similar result can be achieved by replacing gussets **7** with a continuous reinforcing bead or shoulder at the intersection of the exterior surfaces of top **42***c* and member **43***c*.

FIG. **12** illustrates a shape wherein seal surface **12***d* is cylindrical rather than curved.

FIG. **13** shows a structure in which top **42***c* is closer to the level of rim **44***e*. Surface **12***e* engages the surface of cylinder **43***e* below the level of top **42***e*.

Directing attention to the modification shown in FIGS. **14** and **15**, formation of a modified container neck is shown. Such a neck may resemble that shown in FIGS. 1 and 2 of U.S. Pat. No. 4,699,287, with an important modification, as hereinafter explained. In FIG. **14** the parison forming the neck is shown between a blow pin **86** and shear steel **76** and neck insert **21** as molding is being completed.

Shear steel **76** has an inward projection **77** terminating in a vertical inward extending shearing edge **78**. Blow pin **86** has a lower cylindrical portion **87** having an outward extending shearing edge **88** with a groove **89** thereabove.

As shown in FIG. **14**, blow molding of the parison to the shape of shear steel **76** and neck insert **81** has just been completed. The shape of the parison generally resembles the neck shown in said U.S. Pat. No. 4,699,287. Edge **88** is located below edge **78**. Air blowing through hole **91** has formed vertical stretch **101** and inward horizontal stretch **102** as well as the portions thereabove. The smooth, vertical, lower cylindrical portion **87** has formed internal primary seal surface **12***f*.

The blow pin **86** then moves from the position of FIG. **14** to the position of FIG. **15**. The neck structure is sheared between edges **78** and **88**. Inner flange edge **96** is formed where the edges **78**, **88** have sheared the same and the parison sheared-off portion **94** thereabove is discarded.

It is noted that edge **96** is of a larger diameter than primary seal surface **12***f*. hence the hollow plug or inner skirt of a cap such as that shown in U.S. Pat. No. 4,699,287 seated on the container neck seals against surface **12***f* instead of surface **96**. Since blow pin **86** has no parting line surface **12***f* has no flash. Surface **12***f* is smooth and its diameter is always the same during repetitive molds and hence makes a superior seal with the cap plug.

In FIGS. **8**, **9**, **10**, **12**, **13** and **14** in general, the same reference numerals are used for parts corresponding to FIG. **7**, followed by subscripts a, b, c, d, e and f respectively.

The foregoing descriptions of specific embodiments of the present invention have been presented for purposes of illustration and description. They are not intended to be exhaustive or to limit the invention to the precise forms disclosed, and obviously many modifications and variations are possible in light of the above teaching. The embodiments were chosen and described in order to best explain the principles of the invention and its practical application, to thereby enable others skilled in the art to best utilize the invention and various embodiments with various modifications as are suited to the particular use contemplated. It is intended that the scope of the invention be defined by the claims appended hereto and their equivalents.

What is claimed is:

1. A neck for a blow-molded plastic container for use with a cap having a top, an outer skirt depending from the top and a plug substantially vertically depending from the top, the plug being located inward of the outer skirt with an annular gap between the skirt and the plug, said neck comprising a sealing portion having a smooth, internal circumferential primary seal surface characterized by the absence of mold parting lines positioned and dimensioned to sealingly engage the plug, an outward bend at an upper end of said sealing portion, an outward extending stretch beyond said outward bend, an upward-inward bend at an outer end of said outward extending stretch, and an inwardly-upwardly extending flange beyond said upward-inward bend, said flange terminating at a trim line having a circumference greater than that of said sealing portion so that said trim line does not engage the plug of the cap to form a primary seal, whereby said trim line is outward of the plug of the cap in the assembled position of said neck and the cap, said flange being thin and flexible.

2. A neck according to claim **1** in which said sealing portion is circular in plan view with a minimal variation from ovality.

3. A neck according to claim **1** in which said internal primary seal surface is curved in vertical cross section.

4. A neck according to claim **1** in which said internal primary seal surface is substantially straight in vertical cross-section.

5. A neck according to claim **1** in which no part of said neck above said sealing portion is thicker than said neck at said sealing.

6. A neck according to claim **1** in which said outward stretch is spaced apart from said flange and diverges from said flange.

7. A neck according to claim 1 in which said flange has a bottom surface spaced from said outward stretch.

8. In combination, a neck for a blow molded plastic container and a cap, said cap having a top, an outer skirt depending from said top and a plug substantially vertically depending from said top, said plug being located inward of said outer skirt with an annular gap between said outer skirt and said plug, said neck comprising a sealing portion having a smooth, internal circumferential primary seal surface characterized by the absence of mold parting lines sealingly engaging said plug, an outward bend at an upper end of said sealing portion, an outward extending stretch beyond said outward bend, an upward-inward bend at an outer end of said outward extending stretch, and an inwardly-upwardly extending flange beyond said upward-inward bend, said flange terminating at a trim line having a circumference greater than that of said sealing portion, said trim line being spaced from said plug and not sealing against said plug, said trim line being located outward of said plug, said outward bend, outward extending stretch, upward-inward bend and flange being located in said annular gap.

9. The combination of claim 8 in which said outward extending stretch engages said outer skirt.

10. The combination of claim 8 in which said cap further comprises neck engaging means on said outer skirt and in which said neck has a lower portion extending outwardly-downwardly from said sealing portion and which further comprises cap engaging means on said lower portion located below said sealing portion, said cap engaging means being positioned to engage said neck engaging means.

11. The combination of claim 10 in which said lower portion is formed with a detachable portion, said cap engaging means being located on said detachable portion.

12. The combination of claim 8 in which said outer skirt comprises an upper skirt portion having a first downward-outward slanted stretch below said top, a substantially cylindrical stretch below said first slanted stretch, a second downward-outward slanted stretch below said cylindrical stretch and a lower skirt portion depending from a lower end of said second downward-outward slanted stretch, said outer skirt being formed with a frangible line of weakness between said second downward-outward stretch and lower skirt portion and which further comprises tear off means for tearing off said lower skirt portion at said frangible line of weakness.

13. The combination of claim 12 in which said tear off means comprises a horizontal tear tab, means joining one end of said tear tab to said lower skirt portion and a notch in said lower skirt portion adjacent said one end of said tear tab.

14. The combination of claim 12 which further comprises vertical external ribs extending from said cylindrical stretch and said second downward-outward stretch.

15. The combination of claim 8 in which said top comprises a cylindrical member extending above and below said top and an indented central portion inward of said cylindrical member, said cap further comprising a rim extending outward of said cylindrical member, said outer skirt depending from the outer edge of said rim, said sealing portion engaging said cylindrical wall.

16. The combination of claim 15 in which said sealing portion engages said cylindrical member above said indented central portion.

17. The combination of claim 15 in which said sealing portion engages said cylindrical member substantially at said indented central portion.

18. The combination of claim 15 in which said sealing portion engages said cylindrical member below said indented central portion.

19. The combination of claim 15 in which said cap further comprises a plurality of radial, angularly-spaced gussets at an intersection of said indented central portion with said cylindrical member.

20. A neck for a blow-molded plastic container for use with a cap having a top, an outer skirt depending from the top and a plug substantially vertically depending from the top, the plug being located inward of the outer skirt with an annular gap between the skirt and the plug, said neck comprising a sealing portion having a smooth, internal circumferential primary seal surface characterized by the absence of mold parting lines positioned and dimensioned to sealingly engage the plug, an outward bend at an upper end of said sealing portion, an outward extending stretch beyond said outward bend, an upward-inward bend at an outer end of said outward extending stretch, and an inwardly-upwardly extending flange beyond said upward-inward bend, said flange terminating at a trim line having a circumference greater than that of said sealing portion whereby said trim line is outward of the plug of the cap in the assembled position of said neck and the cap, said flange being thin and flexible, a horizontal distance between said sealing portion and said upward-inward bend being greater than a vertical distance between a midpoint on said sealing portion and said trim line.

21. In combination, a neck for a blow molded plastic container and a cap, said cap having a top, an outer skirt depending from said top and a plug substantially vertically depending from said top, said plug being located inward of said outer skirt with an annular gap between said outer skirt and said plug, said neck comprising a sealing portion having a smooth, internal circumferential primary seal surface characterized by the absence of mold parting lines sealingly engaging said plug, an outward bend at an upper end of said sealing portion, an outward extending stretch beyond said outward bend, an upward-inward bend at an outer end of said outward extending stretch, and an inwardly-upwardly extending flange beyond said upward-inward bend, said flange terminating at a trim line having a circumference greater than that of said sealing portion, said trim line being located outward of said plug, said outward bend, outward extending stretch, upward-inward bend and flange being located in said annular gap, a horizontal distance between said sealing portion and said upward-inward bend being greater than a vertical distance between a midpoint on said sealing portion and said trim line.

22. An intermediate article of manufacture for subsequent trimming to form a neck for a blow-molded plastic container for use with a cap having a top, an outer skirt depending from the top and a hollow plug substantially vertical depending from the top, the plug being located inward of the outer skirt with an annular gap between the skirt and the plug, said article of manufacture comprising a sealing portion having a smooth, internal, circumferential primary seal surface characterized by the absence of mold parting lines positioned and dimensioned to sealingly engage the plug, an outward bend at an upper end of sealing portion, an outward extending stretch beyond said outward bend, an upward-inward bend at an outer end of said outward extending stretch, and an inwardly-upwardly extending flange beyond said upward-inward bend, said flange having a terminus having a circumference greater than said sealing portion, and a blow dome extending upwardly-outwardly of said terminus, said terminus comprising a trim line for subsequently trimming off said blow dome.

* * * * *

March 23, 1971 J. G. LIVINGSTONE 3,572,413

CONTAINER AND SNAP-ON COVER

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FIG. 1

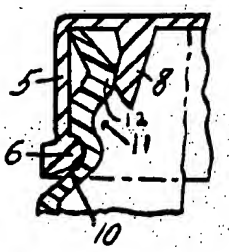


FIG. 2A

FIG. 2

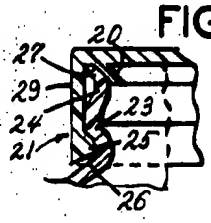


FIG. 3

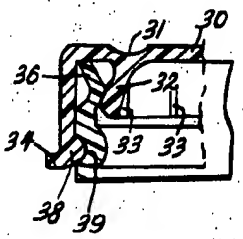


FIG. 4

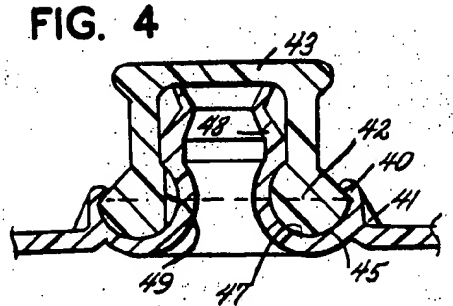


FIG. 5

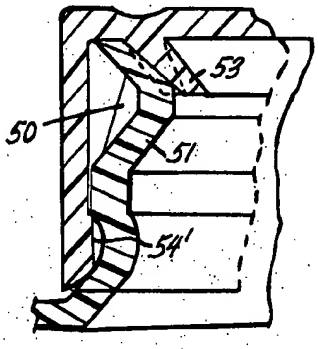
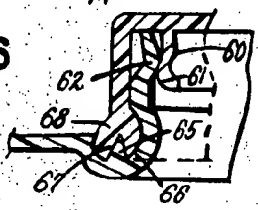


FIG. 6



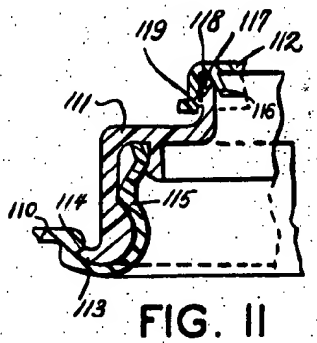


FIG. 11

FIG. 7

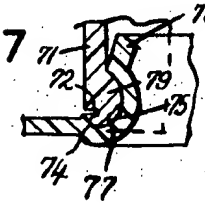


FIG. 9

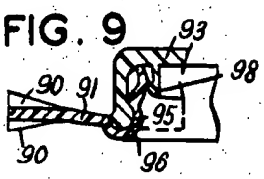
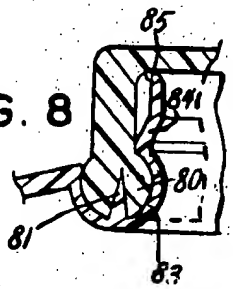


FIG. 8



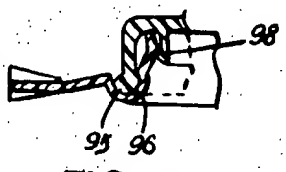
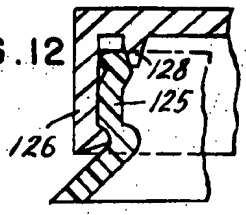


FIG. 10

FIG. 12



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CONTAINER AND SNAP-ON COVER

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FIG. 5A

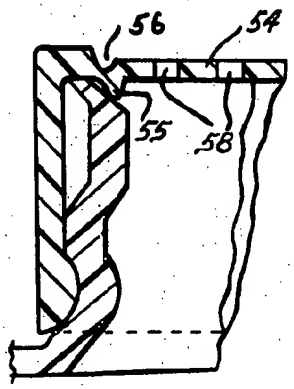
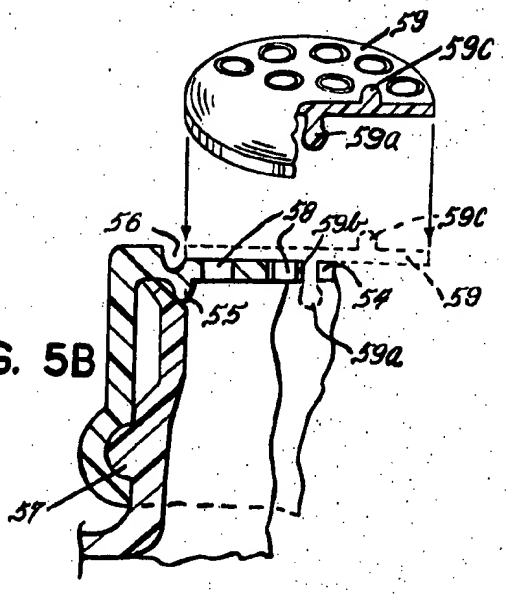


FIG. 5B



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Patented Mar. 23, 1971

3,572,413

CONTAINER AND SNAP-ON COVER

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Continuation of application Ser. No. 768,214, Oct. 11, 1968, which is a continuation of application Ser. No. 665,482, Sept. 5, 1967, which in turn is a continuation-in-part of application Ser. No. 545,676, Apr. 27, 1966. This application June 19, 1969, Ser. No. 866,404
Int. Cl. B65d 23/00, 41/16
U.S. Cl. 150—.5 13 Claims

ABSTRACT OF THE DISCLOSURE

A plastic container with an opening at the top and bulging inwardly adjacent its top, as in a neck or spout or the like is provided with a snap-on skirted cover, usually an ordinary cap but it may be a shaker top, etc. Different depending annular tongue means on the fitment are disclosed for pressing outwardly at the bulge of the fitment to enlarge and/or lengthen the spout and press it into sealing contact against either the skirt or top of the cover, or both. The container need not extend to the inside of the top of the cover.

This is a continuation of my application Ser. No. 768,214 filed Oct. 11, 1968 (now abandoned) which is a continuation of my application Ser. No. 665,482 filed Sept. 5, 1967 (now abandoned) which is a continuation-in-part of my application Ser. No. 545,676 filed Apr. 27, 1966 (now abandoned).

This invention relates to the assembly of a container and snap-on cover.

The container is provided at its top with an opening for introducing and dispensing a liquid or solid, usually at the top of a neck or spout although the diameter of the opening may be the same as the inside diameter of the bottom of the container. The entire container, or at least the portion immediately below the opening, is of flexible plastic. The cover is usually an ordinary snap-on cap, but it may be a shaker top, etc. It is usually of flexible resilient plastic but may be of a rigid composition.

The cover is provided with a skirt. It is placed over the opening and held in place by a snap-on bead and groove. There is an annular inward bulge in the container near its top. The bulge is in the portion of the container which is plastic if the entire container is not plastic. It is formed by the wall of the container slanting inward toward the bulge, both above and below the bulge. Pressure is maintained on the bulge by suitable annular tongue means which depends from the top of the cover. Various types of bulges and tongue means are shown in the accompanying drawings, all of which drawings relate to circular spouts and fitments and most of which show only a portion of the top of the container. Many show sections through only one side of the top of the container and cover, or a portion thereof. The container is usually a bottle, but may be a squeezable tube, etc.

Generally, the top of the container and cover will be made of a stiff, resilient plastic such as polyethylene (for example, medium-density grade rather than low or high density) although other plastics may be used with which a seal may be effected by pressure contact. The cover is easily removable. The neck or spout may be separate from the rest of the container, as is known in the art.

Although other covers may be used, the invention will be described more particularly as applied to a usual closure cap. Using a snap-on cover, as disclosed, the pressure of the tongue against the bulge in the container maintains pressure contact between the top of the container and the cover in those constructions in which the top of the container contacts the inside top of the cover. In such structures, the top of the container is thus sealed against the top of the cover. Because of the difficulty of maintaining the length of the neck or the like of many types of containers within close tolerances, it is often expedient to provide a space between the top of the container and the cover, and in this case the pressure on the bulge enlarges the top of the container into pressure contact with the skirt of the cover.

FIGS. 1 to 3 show a snap-on bead on the interior of a cover engaged in a groove in the outer wall of the neck of a container, with different structures for maintaining the neck and cover in pressure contact;

FIG. 2A is a detail of the cover shown in FIG. 2 before engagement with the container, with a dotted-line suggestion of the flexing of the tongue which occurs on engagement of the cover with the container;

FIG. 4 is a section through the whole of a cover with a bead at its bottom engaged in a groove in the container;

FIG. 5 is a modification of the assembly shown in FIG. 2;

FIG. 5A is a shaker-top modification of the assembly shown in FIG. 5;

FIG. 5B is an exploded view of a modified shaker-top arrangement, showing a portion of the top lifted, and showing it also in dotted lines in position on the container;

FIG. 6 illustrates a different type of engagement of the bead on the bottom of a cover with a groove in a container;

FIGS. 7 and 8 are modifications of the assembly shown in FIG. 6;

FIGS. 9 and 10 are different views of a cover on a container with the cover engaged in a groove in the container;

FIG. 11 illustrates a three-part assembly embodying improvements of this invention; and

FIG. 12 illustrates an assembly in which there is a space between the top of the container and the cover and a seal is maintained between the container and the skirt of the cover.

The assembly is particularly adapted for use in the utilization of containers in which downward and upward flexing of the top of a container are not necessary for engaging and releasing the cover, such as is required in structures described in my Patent 3,199,750. Wedges or the like may be provided above and/or below the top of the container where it joins the wall of the container (FIGS. 9 and 10) to prevent or limit such flexing.

The closure cap **5** of FIG. 1 is provided with bead **6** around its bottom, and there is a flexible and resilient annular tongue **8** extending downwardly from its top. The groove **10** in the wall of the bottle neck **11** accommodates the bead **6**. When the cap is snapped in place with bead **6** in groove **10**, the tongue **8** exerts positive outward pressure against the bulge **12** in the neck. This enlarges and lengthens the neck, and its top is pressed into pressure contact with the cap at the juncture of its top and skirt. The bead **6** is easily flexed outward as the cap is engaged in the groove **10** of the neck, usually with some inward giving of the neck, and this also takes place when the cap is removed.

FIGS. 2 and 2A show a different tongue **20** on the cap **21**, which is flexed inward as shown in FIG. 2, and as indicated in dotted lines in FIG. 2A, when the cap is engaged with bottle neck **23**. The bead **25** is engaged in groove **26** when the cap is on the neck. The neck bulges inwardly at **24**, above the groove and flares outwardly at its top **27**. The outward pressure of tongue **20**, aided by the confinement effected by the wall **29** of the cap, keeps the top of the neck in pressure contact against the cap, and particularly against its top.

The cap 30 of FIG. 3 is similar to the cap of FIG. 2, except for the indentation 31 above the tongue 32 which facilitates its flexing, and the ribs 33 which stiffen the tongue. A small tab 34 is provided to facilitate removal of the fitment from the container. The tongue 32 is hooked under the inward bulge in the neck. The top 36 of the neck is pressed by the tongue 32 to hold it in a firm position so as to maintain pressure contact between its top and the top of the cap. The bead 38 on the neck is engaged in groove 39 in the outer wall of the neck.

In FIG. 4, lip 40, preferably but not necessarily stiffened by ribs 41, tends to engage the bead 42 at the bottom of the cap 43. The rounded outer undersurface 45 of the bead presses this lip 40 outward as the cap is placed on the container, and the lip closes over the bead after it is seated in the groove 47 in the container. There might be a tongue extending down from the top of the cap to tend to straighten the container 48 to insure pressure contact between it and the top of the cap.

At several places on the inner surface of bead 42 it is desirable to provide flat spots 49 or indentations which collect air as the cap 43 is being pressed over the neck 48 and release it upward just before the bead of the cap is seated in groove 47.

The assembly of FIG. 5 is a modification of that illustrated in FIG. 2. It includes the rib 50 to stiffen neck 51. The flange 53 presses outwardly against the neck, tending to straighten it and thus maintain its top in pressure contact with the top of the cap.

In the modifications shown in FIGS. 5A and 5B the cover is provided with a shaker top 54. The annular tongue 55 of FIGS. 5A and 5B is shaped somewhat differently from the tongue 53 of FIG. 5, and indentation 56 is somewhat deeper than the indentation shown there. The indentation 56 is offset outwardly from tongue 55 to facilitate flexing the tongue 55 out into the corner of the cap. The cap in each of these views has a shaker top with openings 58 in one-half of the top.

In FIG. 5B, the interlocking of the wall of the cap and the neck is reversed because the circumferential bead 57 on the neck fits into a circumferential groove in the cover to pull the cover down and hold it in tight engagement with the top of the neck. This bead is advantageously flattened or depressed at several places 54' (FIG. 5) around its circumference for the same reason that bead 42 is deformed at 49 (FIG. 4). The openings 58 are concentrated in one-half of the top 54 of the cover. The element 59 with openings in half of it arranged in the same pattern as openings 58 is provided with projection 59*a* which is held in the opening 59*b* located centrally of the top 54, to provide for its rotation. The projection 59*c* which extends upwardly from element 59 is used to assist in such rotation so as to register the openings in the top 54 and element 59 when the contents of the container are to be shaken out, and to close the openings 58 in the top 54 by the blank half of element 59 when this is desired.

In FIG. 6, the tongue 60 is of substantially uniform thickness and can readily snake itself out of the mold in which it is formed. The bulge 61 in the tongue cooperates with the inward bulge 62 of the neck to tend to straighten the neck and maintain pressure contact between the top of it and the cover. The wedge 65 which extends into the groove 66 widens at a greater angle than the groove 67 in the bead 68, so that as the cover is pressed over the neck, the bead 68 is broadened to make a tight fit in the groove 66.

In the assembly illustrated in FIG. 7, the bead 79 on the cap 71 is notched at 72, and there is an abutment 74 in the groove 75 in the container. The space between the abutment 74 and the wall of the groove is smaller than the projection 77 which fits into it, so that when the fitment is pressed over the spout 78 the projection 77 makes a tight fit in the groove.

Comparing the assembly of FIG. 8 with that shown in FIG. 6, it will be noted that the bead 80 is more rounded.

The wedge 81 spreads the bead as it enters the groove 83, causing the bead to make a tight fit in the groove 83. The top 85 of the neck 84 is bent outward and makes sealing contact with the cover as it is held against it by the tight engagement of the bead 80 in the groove 83.

In FIG. 9, the webs 90 fit between the top 91 of the container and its side wall (not shown) and resist flexing of the top as pressure is applied when the cap 93 is pressed over the neck. The lower web 90 is not needed on blown plastic bottles. The top 91 of the container is depressed by pressure on the cover and the bead 95 is held in the groove 96. The flange 98 tends to straighten the neck and maintain its top in pressure contact with the cover. Although webs 90 prevent flexure of the top adjacent the wall of the container, the top may flex between the webs 90 and groove 96, as shown.

In FIG. 10, the pressure on the cover has been relieved and the groove 96 does not wrap around the bead 95, as shown in FIG. 9, so that the cover can be readily lifted off of the container.

The assembly of FIG. 11 includes container 110, a first fitment 111 and a second fitment or cover 112, all preferably made of plastic, although the cover 112 may be of metal, glass or other rigid construction material. The bead on the first fitment is provided with a projection 113 which fits under lip 114 on the top of the container when the first fitment is pressed over the neck 115 of the container. The tongue 116 of the second fitment is preferably flexible and functions in the manner of the tongue illustrated in FIGS. 2 and 2A to keep the bulge in the neck under pressure so that its top presses against the inner surface of the cover. The top of the neck of the first fitment is bulged in at 117 near its top to make it non-dripping. The tongue on fitment 111 presses it into contact with the top of the fitment. The bead 118 below groove 117 is engaged in the groove 119 in the inner surface of the depending edge of fitment 112. When this fitment is placed over the first fitment 111, bead 118 becomes engaged in groove 119 maintaining the top of this neck in pressure contact with the second fitment. This second fitment may be a shaker top or it may be formed with a spout, etc.

In FIG. 12, the top of the neck 125 does not contact the inside top of the cap 126. Thus it is not necessary to hold the length of the neck within close tolerances. The tongue 128 presses outward on the bulge of the neck, when the cap is snapped in place, pressing the top of the spout into sealing contact with the inside of the skirt of the cap.

In most cases the lip of the neck or spout is thin as at 36 in FIG. 3, so that when the snap-on bead seats, this lip can flex and/or it may flex at the juncture as shown at 62 in FIG. 6.

The effect of pressure on the bulge will depend upon the direction in which the top of the neck can move. If the top of the neck is already touching the top of the cap the pressure will force the neck outwardly and enlarge it. If there is a space between the top of the neck and the top of the cap, the pressure on the bulge must be such as to push the top of the neck outwardly to bring it into sealing contact with the skirt of the cap.

Although the drawings show a tongue of a sort extending from the top of the cover to apply pressure to the inner surface of the bulge in the container, it is to be understood that instead of a tongue, the top of the cover may be dished to provide such pressure.

The invention is covered in the claims which follow.

I claim:

1. The assembly of (1) a container with a resilient neck the upper portion of which is plastic, the neck having an opening in the top, and (2) a snap-on cover with a skirt, which cover is over said top, the inner and outer surfaces of the plastic wall of the neck slanting into a bulge and then slanting out, an annular tongue in the cover which depends from the top thereof with the neck

between the skirt and the tongue, and with the tongue in pressure contact with the neck adjacent said bulge and lengthening or enlarging the neck to press the same against the cover with the upper surface of the outwardly slanting wall of the neck immediately above the innermost portion of the bulge exposed from above to be contacted by the tongue when the cover is placed on the container.

2. The assembly of claim 1 in which the top of the neck is not in contact with the top of the cover.

3. The assembly of claim 1 in which the pressure of the tongue against the neck maintains the top of the neck in pressure contact with the cover.

4. The assembly of claim 1 in which the cover is of resilient plastic.

5. The assembly of claim 1 in which the top edge of the neck is in pressure contact with the skirt.

6. The assembly of claim 1 in which there are substantially vertical ribs on the inner surface of the tongue which stiffen it.

7. The assembly of claim 1 in which there is a bead around the bottom of the skirt and an inwardly directed lip on the container below the neck, which bead forces the lip outward as the cover is placed on the container and said lip closes over the bead when the cover is seated on the container.

8. The assembly of claim 1 in which the bottom of the bead is indented circumferentially and a wedge projects up from the container which is seated in the indentation and spreads the bead against the lip and neck.

9. The assembly of (1) a container with a neck the upper portion of which is plastic and an opening in the top, and (2) a snap-on cover with a skirt, which cover is over said top, in which assembly the top edge of the neck is not in contact with the cover, an annular tongue in the cover depends from the top thereof, with the neck between the skirt and the tongue, the inner and outer surfaces of the plastic wall of the neck slanting in and out to an inward bulge in the neck, with the upper surface of the outwardly slanting wall of the neck immediately above the bulge exposed from above to be contacted by the tongue when the cover is placed on the container, and with the tongue in pressure contact with the neck adjacent the innermost portion of the bulge.

10. The assembly of (1) a container with an opening in the top, and (2) a snap-on cover with a skirt, which cover is over said top, the inner and outer surfaces of the plastic wall of the neck slanting in and out to an inward bulge in the container near its top, and an annular tongue in the cover which depends from the top thereof and is in pressure contact with the inner surface of the container adjacent said bulge and lengthening or enlarging the neck to press the same against the cover, with the upper surface of the outwardly slanting wall immediately above the bulge exposed from above to be contacted by the tongue when the cover is placed on the container.

11. The assembly of claim 10 in which the cover is of resilient plastic.

12. The assembly of claim 10 in which the container terminates upwardly in a neck which is in pressure contact with the top of the cover.

13. The assembly of claim 10 in which the container terminates upwardly in a neck the top of which is out of contact with the top of the cover and is in pressure contact with its skirt.

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DONALD F. NORTON, Primary Examiner

U.S. Cl. X.R.

215—31, 40, 41

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United States Patent [19]

Morton

[11] Patent Number: 5,259,522

[45] Date of Patent: Nov. 9, 1993

[54] **LINERLESS CLOSURE**

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[73] Assignee: **H-C Industries, Inc.**, Crawfordsville, Ind.

[21] Appl. No.: **930,854**

[22] Filed: **Aug. 14, 1992**

[51] **Int. Cl.**[5] **B65D 53/00**

[52] **U.S. Cl.** **215/344**; 215/341; 215/343; 215/345; 215/DIG. 1; 215/252; 215/307

[58] **Field of Search** 215/344, 341, 343, 345, 215/DIG. 1

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Primary Examiner—Allan N. Shoap
Assistant Examiner—Vanessa Caretto
Attorney, Agent, or Firm—Dressler, Goldsmith, Shore, Sutker & Milnamow, Ltd.

[57] **ABSTRACT**

A linerless plastic closure is configured for side-sealing engagement with an associated container. The closure includes a circular top wall portion, and an annular skirt portion depending from the top wall portion, and including an internal thread formation. A two-component side-seal arrangement is provided which includes a relatively rigid support annulus, and a relatively flexible sealing lip. The sealing lip is movable into a position for sealingly engaging a generally outwardly facing surface of an associated container, with the relatively rigid support annulus desirably acting to enhance the sealing effect of the sealing lip. Notably, the relatively rigid sealing annulus further desirably acts to provide a self-centering action for the closure during application to a container.

11 Claims, 1 Drawing Sheet

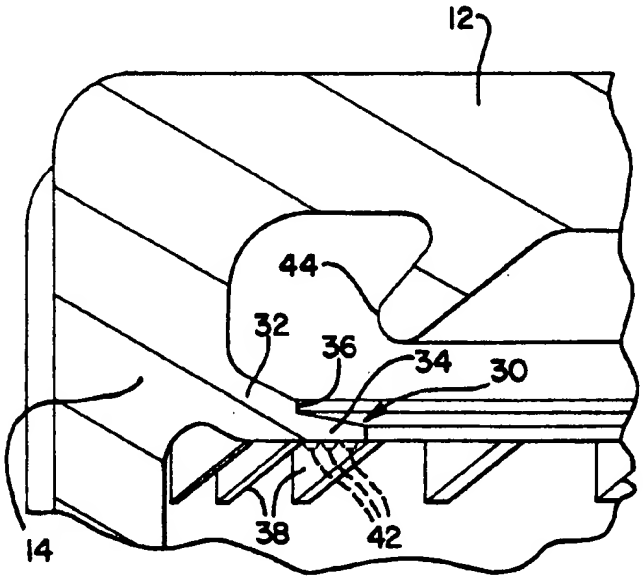


FIG. 1

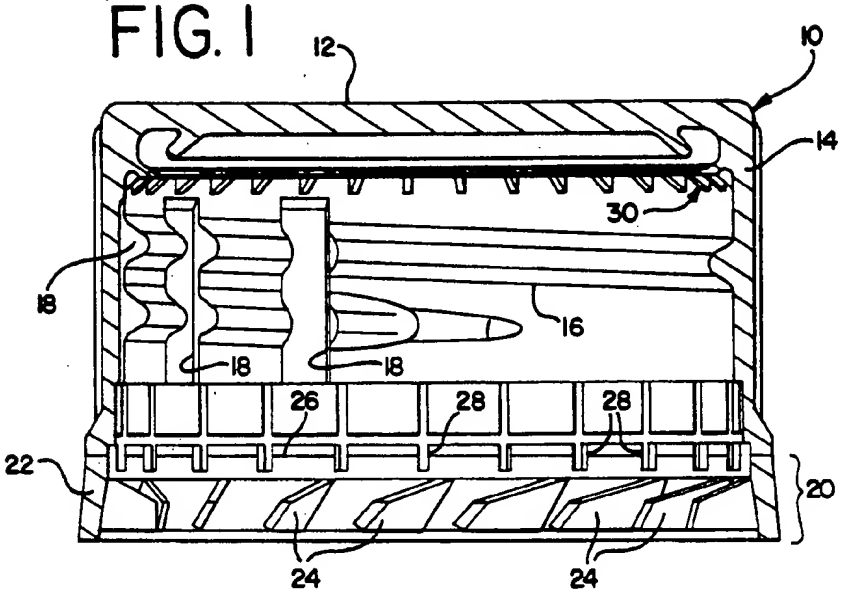


FIG. 2

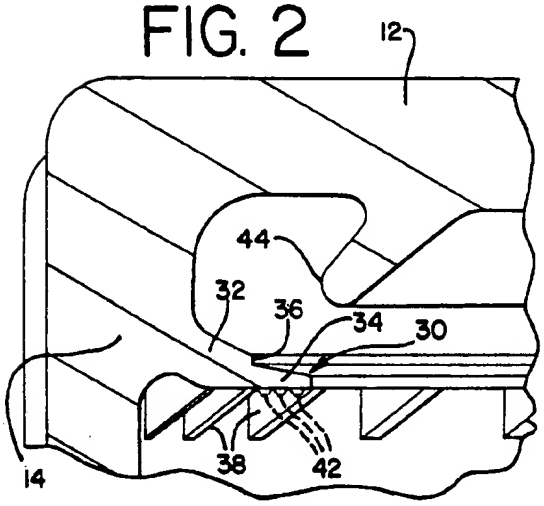


FIG. 3

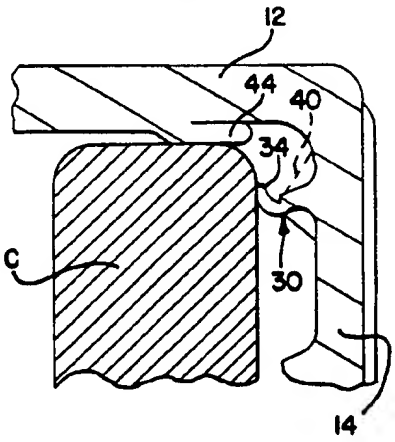
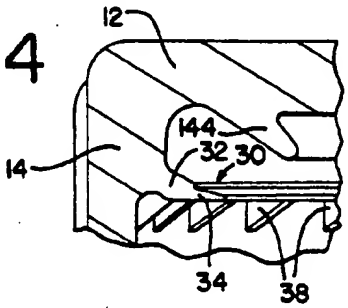


FIG. 4



LINERLESS CLOSURE

TECHNICAL FIELD

The present invention relates generally to a plastic closure for use with an associated container, and more particularly to a linerless closure including a side-seal arrangement comprising a support annulus, and an integral, relatively flexible sealing lip.

BACKGROUND OF THE INVENTION

Molded plastic closures for containers have become increasingly popular for closing and sealing the contents of containers, such as for use with carbonated and non-carbonated beverages, condiments, and other food products, as well as for use on non-food products, such as motor oil. While various plastic closure constructions have been known for a number of years, special design considerations must be made in order for the desired sealing to be effected, and to facilitate high-speed manufacture and application of such closures.

In order to achieve the desired sealing performance, a number of heretofore known closure constructions have been of a composite nature, including a relatively rigid outer plastic shell, and a relatively pliable and soft inner sealing liner. One such construction, formed in accordance with commonly-assigned U.S. Pat. No. 4,343,754, U.S. Pat. No. 4,378,893, U.S. Pat. No. 4,407,422, and U.S. Pat. No. 4,497,795, all incorporated herein by reference, have proven to be highly effective for use on containers, including containers having carbonated or otherwise pressurized contents. The desired sealing performance is achieved by configuring this closure construction to include a relatively rigid and strong threaded outer closure cap, with an in situ formed liner positioned adjacent a top wall portion of the cap. Closures in accordance with these patents are configured to form a so-called top/side seal, in that the liner can sealingly engage both a generally upwardly facing surface of an associated container, as well as a generally outwardly facing, side surface of the container.

While it will be appreciated that eliminating the inner sealing liner of such closure construction would decrease the attendant cost of its manufacturing use, it has heretofore proven difficult to provide a closure construction exhibiting the requisite strength, while at the same time including a sealing arrangement exhibiting sufficient flexibility and conformability to achieve the desired sealing engagement with associated containers. Development of a linerless, one-piece closure construction suitable for use on containers having pressurized contents has heretofore met with limited success.

Another design consideration which must be addressed concerns application of closures. Experience has shown that a typical threaded closure can exhibit a tendency to skew during application, which is believed to result from the asymmetrical nature of the typical single helical thread formation within the closure. Specifically, the side of the closure at which the closure thread terminates at or near the top wall portion of the closure exhibits a relatively high degree of rigidity and strength. In contrast,. the opposite side of a single thread closure, whereat the thread is disposed one-half thread pitch further from the top wall portion, is the so-called "weak side" of the closure, exhibiting relatively less rigidity and strength (this phenomenon is not so pronounced with multi-thread closures, which tend

to balance the application forces due to the symmetry of the multiple threads).

As a consequence, application of a single thread closure ca result in skewing of the closure as the "strong side" engages the associated container more securely and firmly than the "weak side" of the closure. Experience has shown that skewing of the closure which results from this effect can adversely effect the sealing performance of the closure, since its sealing element or elements may not be firmly and squarely seated on the container. This skewing can adversely affect both proper seating of a top seal as well as proper seating of a side seal.

The present closure is particularly configured for enhanced sealing performance while facilitating application to a container.

SUMMARY OF THE INVENTION

A linerless plastic closure embodying the principles of the present invention is configured to include a side-seal arrangement for sealingly engaging a generally outwardly facing side surface of an associated container. Notably, the side-seal arrangement includes two distinct portions, i.e., a relatively rigid outer support annulus, and a relatively flexible inner sealing lip extending integrally from the support annulus. By this arrangement, the relatively flexible sealing lip readily conforms to the container finish for the desired sealing engagement, with the associated support annulus supporting the flexible lip in a manner which achieves relatively high per unit area sealing force. Additionally, the relatively rigid support annulus provides a desired centering effect, during high-speed application, which facilitates application of the closure without undesirable skewing or the like.

In accordance with the illustrated embodiment, the present plastic closure includes a circular top wall portion, and an annular skirt portion depending integrally from the top wall portion. The skirt portion includes an internal thread formation configured for engagement with the associated container, with the illustrated embodiment including a single helical thread (as opposed to a double thread, triple thread, etc.).

The side-seal arrangement of the closure extends integrally inwardly from the skirt portion for sealingly engaging a generally outwardly facing surface of the associated container. As noted, the side seal arrangement includes a relatively rigid, outer support annulus which extends integrally inwardly from the skirt portion, and a relatively flexible inner sealing lip extending integrally inwardly from the support annulus. The sealing lip is movable, toward the top wall portion, to a generally upwardly extending disposition relative to the support annulus during application of the closure to a container so that the sealing lip sealingly engages the outwardly facing surface of the container.

The desired relative flexibility of the sealing lip is achieved by configuring the sealing lip to have an average axial thickness less than the average axial thickness of the support annulus. In accordance with the illustrated embodiment, the side seal arrangement includes a stepped portion which defines a distinct change in axial thickness at the juncture of the outer support annulus and the inner sealing lip. By this configuration, a hinge mechanism is provided at the stepped portion, with the sealing lip configured for relative flexibility for the desired sealing engagement with the container, while

the relatively rigid support annulus exhibits the necessary rigidity to effect support of the sealing lip, and centering of the closure on a container.

In the preferred form, the support annulus is rigidified by the provision of a plurality of circumferentially spaced gussets which extend between the support annulus and the skirt portion of the closure. The rigidifying gussets are preferably configured to extend between the lower surface of the support annulus and the skirt portion of the closure, but can be alternately, or additionally, provided to extend between an upper surface of the annulus and the skirt portion of the closure.

In accordance with the illustrated embodiment, a top-seal element is provided depending from the top wall portion of the closure. This top-seal element can be provided in the form of a downwardly, outwardly diverging sealing flange, a downwardly, inwardly converging sealing flange, or other suitable top-sealing arrangement (such as a plug-type seal). The top-seal element is configured for sealing engagement with a generally upwardly facing, top surface of the associated container, and can be optionally employed in the present closure construction for enhancing the sealing characteristics of the construction.

Other features and advantages of the present invention will become readily apparent from the following detailed description, the accompanying drawings, and the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a cross-sectional view of a plastic closure embodying the principles of the present invention;

FIG. 2 is a relatively enlarged, fragmentary view illustrating the sealing construction of the present closure;

FIG. 3 is a fragmentary view illustrating the present closure in sealing engagement with an associated container; and

FIG. 4 is a fragmentary view similar to FIG. 2 illustrating a modified embodiment of the present closure.

DETAILED DESCRIPTION

While the present invention is susceptible of embodiment in various forms, there is shown in the drawings and will hereinafter be described presently preferred embodiments, with the understanding that the present disclosure is to be considered as an exemplification of the invention, and is not intended to limit the invention to the specific embodiments illustrated.

With reference now to the drawings, therein is illustrated a linerless, side-seal closure **10** embodying the principles of the present invention. Closure **10** can efficiently and economically be molded from plastic material, such as by compression molding of polypropylene, although other plastic materials, and molding techniques, can be employed.

Closure **10** includes a circular top wall portion **12**, and an annular skirt portion **14** depending integrally from the top wall portion **12**. The skirt portion **14** includes an internal, single helical thread formation **16** configured for threaded engagement with a like thread formation on an associated container (designated C in FIG. 3).

In order to facilitate use of the present closure on a container having carbonated or otherwise pressurized contents, the skirt portion of the closure defines a plurality of axially extending vent grooves **18** which facilitate venting of gas pressure from within the associated container during closure removal.

It is ordinarily desirable to configure a closure such as illustrated for tamper-evident use, and to this end, closure **10** includes an annular pilfer band **20** depending from skirt portion **14**. Pilfer band **20** is illustrated as being configured in accordance with the teachings of U.S. Pat. No. 4,418,828, hereby incorporated by reference, but may alternately be otherwise configured, such as in accordance with the teachings of U.S. Pat. No. 4,938,370, or U.S. Pat. No. 5,004,112, both of which are hereby incorporated by reference.

As illustrated, pilfer band **20** includes an annular band portion **22**, inwardly from which extend a plurality of circumferentially spaced, relatively flexible container-engaging projections **24**. The pilfer band **20** and the skirt portion **14** are separated and distinguished from each other by a circumferentially extending scoreline **26**, with the scoreline **26** extending partially into a plurality of circumferentially spaced frangible ribs **28**. The unscored, residual portions of the frangible ribs **28** provide the desired frangible connection between the pilfer band and the skirt portion.

In accordance with the present invention, closure **10** includes a side-seal arrangement **30** extending integrally inwardly from skirt portion **14**. Notably, side-seal arrangement **30** includes two distinct components, namely, a relatively rigid outer support annulus **32**, which extends integrally inwardly from the skirt portion **14**, and a relatively flexible, inner sealing lip **34**, extending integrally inwardly from the support annulus **32**. As illustrated, the side-seal arrangement **30** includes a stepped portion **36**, at which a distinct change in axial thickness is defined at the juncture of the support annulus **32** and the sealing lip **34**.

As will be appreciated, the side-seal arrangement **30** is configured such that sealing lip **34** has an average axial thickness less than the average axial thickness of the support annulus **32**, with stepped portion **36** defining, in essence, a hinge mechanism for the sealing construction. While this arrangement is presently preferred, it will be understood that the side-seal arrangement may be otherwise configured. For example, the support annulus may taper into the sealing lip, and such tapering may be defined (in cross-section) by converging continuous or discontinuous straight lines, curves, compound curves, or combinations thereof. Such modifications are considered to be within the purview of the subject invention when the result is a relatively rigid support annulus effectively hingedly joined to a relatively flexible sealing lip.

As illustrated, the support annulus **32** is preferably rigidified by the provision of a plurality of circumferentially spaced rigidifying gussets **38** which extend between the lower surface of the support annulus and the inside surface of the skirt portion **14**. A plurality of circumferentially spaced rigidifying gussets may be provided to extend between the upper surface of the support annulus and the skirt portion **14**, such as illustrated in phantom line at **40** in FIG. **3**. As will be appreciated, the preferred provision of rigidifying gussets acts to enhance the axial rigidity of the support annulus, whereby the support annulus desirably acts to support the relatively flexible sealing lip for sealing engagement with the associated container, while at the same time facilitating centering of the closure on a container during high-speed application. Additionally, the disposition of gussets **38** on the side of the support annulus which is

oriented toward the open end of the closure desirably provides a guiding or "funneling" coaction of the gussets **38** with the container, thus further acting to center the closure during application.

FIG. **2** illustrates the sealing arrangement of the present closure prior to application to an associated container. In contrast, FIG. **3** illustrates the closure after application to the associated container C, wherein the sealing lip **34** has been moved to a generally upwardly extending position, relative to the support annulus, so that an inside surface of the sealing lip is presented for sealing engagement with the generally outwardly facing surface of the associated container. For some applications, it can be desirable to provide one or more sealing ribs (such as illustrated in phantom line at **42** in FIG. **2**) for engagement with the container. The one or more sealing ribs extend concentrically on the sealing lip for engaging the container surface.

It is also contemplated that the sealing engagement of sealing lip **34** with the container can be enhanced by dimensioning the inside diameter of the sealing lip, prior to application to the associated container, to have an inside diameter which is slightly less than the outside diameter of the finish of the associated container. By this arrangement, an interference fit is created, resulting in stretching and elongation of the sealing lip, thereby enhancing the sealing effect created thereby.

By the provision of the relatively rigid support annulus **32**, the bending and stretching of the flexible sealing lip **34** is confined to a relatively small area, thereby generating a relatively large sealing contact force, per unit area, between the sealing lip and the sidewall of the container finish. Additionally, if used on a container having pressurized contents, any internal gas pressure which may act against the side-seal arrangement **30** desirably reacts against the seal lip **34** to increase the sealing force against the container.

For some applications, such as on containers having relatively low tolerances (due to greater precision during container molding), the sealing lip **34** can be configured to substantially entirely deform upwardly during closure application. As a result, the base of the sealing lip is brought into substantial contact and alignment with the support annulus **32**, whereby radial sealing forces are directed outwardly through the support annulus and surrounding skirt portion. This desirably elastically deforms this relatively high-strength portion of the closure, creating a high sealing contact force, per unit area, at the container finish, but minimizing permanent deformation of the support annulus and surrounding skirt. Such permanent deformation can result from cold flow or "creep" of the plastic material, but because the sealing forces are distributed over a large portion of the closure structure, cold flow inducing stresses are reduced.

This sealing effect, generally at the base of the sealing lip, can act in concert with the sealing created at the free edge portion of the lip by virtue of its interference fit with the container finish. This can provide two distinct sealing mechanisms for enhanced sealing integrity.

In contrast, use of the present closure on containers exhibiting relatively high manufacturing tolerances (such as glass containers) requires dimensioning the sealing lip **34**, relative to the support annulus **32**, to accommodate such tolerances, while avoiding excessive interference between the support annulus and the container. For these applications, deformation is intended to be substantially confined to the sealing lip, while the support annulus remains relatively undeformed.

Thus, the relatively greater hoop strength and axial rigidity of the support annulus **32** provides not only a desirable self-centering characteristic for the closure, but can further desirably act to confine the elastic deformation of the closure in large part to the flexible sealing lip **34** for high tolerance containers, thereby ensuring relatively large unit pressures at the closure/finish interface, which are necessary to obtain effective sealing performance with the relatively high durometer (i.e., relatively hard) closure material.

As illustrated, the present closure includes a top-seal element illustrated in the form of a downwardly depending, upwardly diverging top-seal flange **44**. Top-seal flange **44** is configured to sealingly engage a generally upwardly facing, top surface of the associated container C, as illustrated in FIG. **3**. The optional provision of the top-seal element desirably enhances the sealing characteristics of the closure. As illustrated in FIG. **4**, the top-seal element may alternately be configured as a downwardly depending, inwardly converging flange **144**.

Additional benefits of the present closure construction relate to its cooperation with the container during application, and during closure removal. During application, the present closure desirably mates with and seats on a container with greater consistency, by virtue of its self-centering nature. This consistency of application, in turn, reduces variability in removal torques, thus enhancing consumer acceptance.

In connection with closure removal, experience has shown that linerless closures having a top-seal only can sometimes exhibit undesired freedom of rotation during closure removal after the top-seal element moves out of sealing engagement with the top surface of the associated container. In distinction, the side-seal arrangement provided by the present closure maintains engagement with the container for a relatively greater amount of rotation of the closure during removal, thereby desirably creating tactile-resistance to removal, and avoiding excessive freedom of rotative movement. This characteristic is believed to enhance consumer acceptance.

From the foregoing, it will be observed that numerous modifications and variations can be effected without departing from the true spirit and scope of the novel concept of the present invention. It is to be understood that no limitation with respect to the specific embodiments illustrated herein is intended or should be inferred. The disclosure is intended to cover, by the appended claims, all such modifications as fall within the scope of the claims.

What is claimed is:

1. A linerless closure for a container, comprising:

a circular top wall portion;

an annular skirt portion, depending integrally from said top wall portion, said skirt portion including an internal thread formation configured for engagement with said container; and

side-seal means extending inwardly form said skirt portion for sealingly engaging a generally outwardly facing surface of said container, said side-seal means comprising a relatively rigid outer support annulus extending integrally inwardly from said skirt portion, and a relatively flexible inner sealing lip extending inwardly from said support annulus and movable in relation to said relatively rigid support annulus toward said top wall portion

for sealing engaging the outwardly facing surface of said container, said sealing lip having an average axial thickness less than the average axial thickness of said support annulus, and being distinguished from said support annulus by a change in axial thickness in said side-seal means which defines a predetermined hinge mechanism for permitting movement of said inner sealing lip relative to said outer support annulus, said side-seal means includes a stepped portion defining a change in axial thickness at the juncture of said outer support annulus and said inner sealing lip to provide said hinge mechanism.

2. A linerless closure in accordance with claim 1, including

means for rigidifying said support annulus comprising a plurality of circumferentially spaced gussets extending between said support annulus and said skirt portion of said closure.

3. A linerless closure in accordance with claim 1, including

top-seal means depending from said top wall portion of said closure for sealingly engaging an upwardly facing surface of said container.

4. A linerless closure in accordance with claim 1, wherein

said stepped portion defines a generally vertically oriented surface.

5. A linerless closure for a container, comprising:

a circular top wall portion;

an annular skirt portion, depending integrally from said top wall portion, said skirt portion including an internal thread formation configured for engagement with said container; and

side-seal means extending inwardly from said skirt portion for sealingly engaging a generally outwardly facing surface of said container, said side-seal means comprising a relatively rigid outer support annulus extending integrally inwardly from said skirt portion, and a relatively flexible inner sealing lip extending inwardly from said support annulus, said side seal means including a hinge mechanism joining said inner sealing lip and said support annulus, with said sealing lip being movable to a generally upwardly extending disposition relative to said support annulus so that said sealing lip sealingly engages the outwardly facing surface of said container,

said closure including means for rigidifying said support annulus comprising a plurality of circumferentially spaced gussets extending between said support annulus and said skirt portion of said closure, said inner sealing lip further being movable relative said circumferentially spaced gussets, said side-seal means includes a stepped portion defining a change in axial thickness at the juncture of said outer support annulus and said inner sealing lip to provide said hinge mechanism.

6. A linerless closure in accordance with claim 5, wherein

said gussets extend between an upper surface of said support annulus and said skirt portion.

7. A linerless closure in accordance with claim 5, wherein

said gussets extend between a lower surface of said support annulus and said skirt portion.

8. A linerless closure in accordance with claim 5, wherein

said sealing lip includes at least one sealing rib for sealingly engaging said container.

9. A linerless closure in accordance with claim 5, including

top-seal means depending from said top wall portion of said closure for sealingly engaging an upwardly facing surface of said container.

10. A linerless closure in accordance with claim 5, wherein

said sealing lip has an average axial thickness less than the average axial thickness of said support annulus.

11. A linerless closure in accordance with claim 10, wherein said stepped portion defines a generally vertically oriented surface.

* * * * *

United States Patent [19]

Crisci

[11] **Patent Number: 4,687,114**

[45] **Date of Patent: * Aug. 18, 1987**

[54] **TAMPER INDICATING CLOSURE FOR CONTAINERS**

[75] Inventor: **Robert E. Crisci**, New Castle, Pa.

[73] Assignee: **Northern Engineering and Plastics Corp.**, New Castle, Pa.

[*] Notice: The portion of the term of this patent subsequent to May 26, 2004 has been disclaimed.

[21] Appl. No.: **820,006**

[22] Filed: **Jan. 21, 1986**

[51] **Int. Cl.**[4] **B65D 53/00**

[52] **U.S. Cl.** **215/256**; 215/344; 215/DIG. 1

[58] **Field of Search** ..... 215/256, 254, 344, DIG. 1

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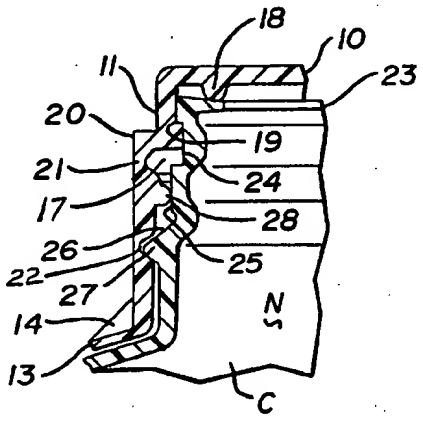
Primary Examiner—Donald F. Norton
Attorney, Agent, or Firm—Harpman & Harpman

[57] **ABSTRACT**

A flexible closure for a container such as a blow molded jug having an inturned flange surrounding an opening therein and a pair of vertically spaced fastening configurations on the neck of the container, the closure having a resilient cap portion with an annular flange depending therefrom, vertically spaced fastening configurations on said annular flange positioned for registry with said fastening configurations on said neck, a lower portion of said annular flange forming a tear skirt. The fastening configurations on the neck of the container and the fastenign configurations on the annular flange of the flexible closure forming dual fasteners, either of which is capable of holding the closure on the neck of the container. One or more resilient flexible depending ribs on the resilient cap portion sealingly engage said inturned annular flange surrounding said opening.

4 Claims, 8 Drawing Figures



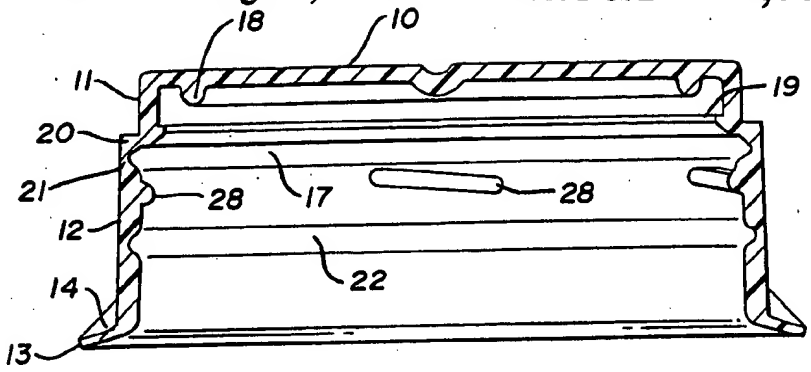


FIG. 1

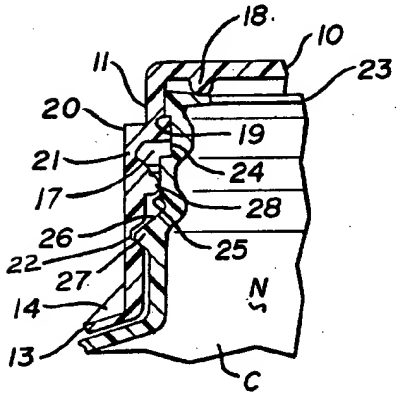


FIG. 2

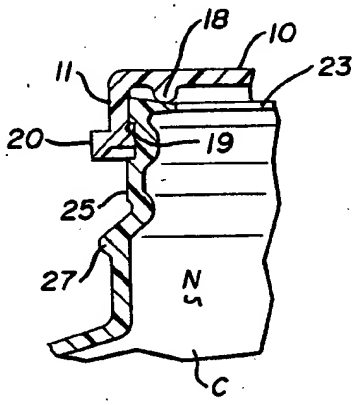


FIG. 3

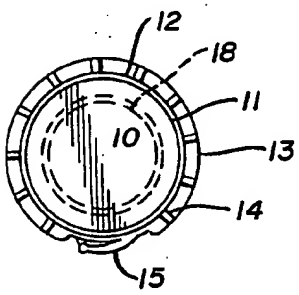


FIG. 4

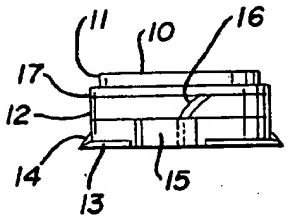


FIG. 5

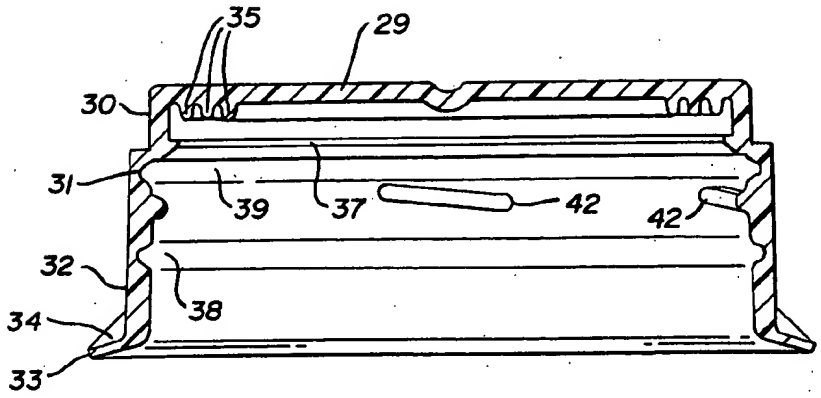


FIG. 6

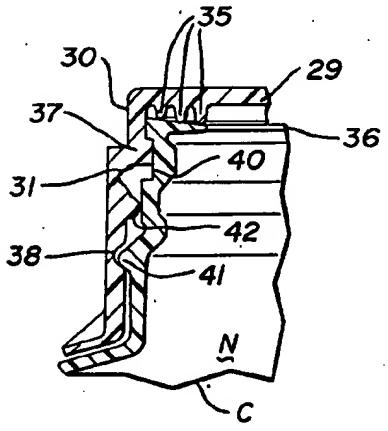


FIG. 7

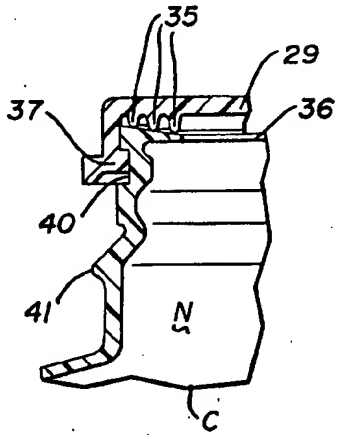


FIG. 8

TAMPER INDICATING CLOSURE FOR CONTAINERS

BACKGROUND OF THE INVENTION

1. Technical Field

This invention relates to tamper indicating closures for containers such as blow molded plastic jugs which are widely used in the dairy industry for the expendible packaging of dairy products, such as milk.

2. Description of the Prior Art

Prior closures of this type may be seen in U.S. Pat. Nos. 3,893,583, 4,202,455, and 4,307,821.

The present invention provides dual fastening of a flexible resilient molded plastic tamper indicating snap-on closure in that the closure includes a top portion with a first depending annular flange having oppositely disposed, outturned and inturned annular flanges on its lower edge, one of which forms a first fastening configuration and the other forms an annular shoulder when the tear skirt is removed.

Resilient depending annular ribs on the closure form a liquid seal when the closure engages the upper surface of an inturned annular flange around the opening in the container.

SUMMARY OF THE INVENTION

A tamper indicating closure for a container such as a blow molded jug with appropriate neck configurations takes the form of a resilient flexible cap portion having a top with a first annular depending flange on its peripheral edge and an inwardly spaced depending annular rib. Outturned and inturned annular flanges are formed on the lower edge of the first annular depending flange of the cap portion and a second annular depending flange of larger diameter than the first annular depending flange is formed on said outturned annular flange. First and second annular grooves are formed in the inner surface of the second annular depending flange so as to define a second fastening configuration and an annular thin frangible wall. The portion of the second annular depending flange below the frangible wall forms a tear skirt. A pull tab is integrally formed with the tear skirt and a vertical groove is formed in the tear skirt adjacent the pull tab. An outturned angular flange is formed on the lower edge of said tear skirt and a plurality of circumferentially spaced gussets are positioned between said angular flange and said tear skirt.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a vertical section of the tamper indicating closure;

FIG. 2 is a vertical section through a portion of the tamper indicating closure and a portion of a neck of a container on which the closure is applied showing the dual fastening means and the depending sealing rib;

FIG. 3 is a vertical section through a portion of the tamper indicating closure after the tear skirt has been removed and showing the closure on a portion of the neck of a container in sealing relation;

FIG. 4 is a top plan view of the tamper indicating closure showing the pull tab;

FIG. 5 is a side elevation of the tamper indicating closure showing the pull tab and a diagonal tear groove in the tear skirt;

FIG. 6 is a vertical section of a modified tamper indicating closure with the depending annular sealing rib;

FIG. 7 is a vertical section of a portion of the modified closure of FIG. 6 on a portion of a neck of a container; and

FIG. 8 is a vertical section of a portion of the modified closure of FIG. 7 with the tear skirt removed.

DESCRIPTION OF THE PREFERRED EMBODIMENT

By referring to the drawings and FIGS. 4 and 5 in particular, a top plan view and a side elevation of the tamper indicating closure may be seen, the closure including a top portion **15** with a relatively short first depending annular flange **11** and a second depending annular flange **12**, the lower edge of which has an outturned annular flange **13** formed on a majority of its annular edge. Several circumferentially spaced gussets **14** join the angular flange **13** and the second annular depending flange **12**. A pull tab **15** is attached to the depending annular flange **12** in the area between the ends of the outturned angular flange **13**.

As illustrated in FIG. 5 of the drawings, the second annular depending flange **12** which is of a larger diameter than the first annular depending flange **11** is provided with a tear groove **16**, the lower portion of which extends substantially vertically alongside the end of the pull tab **15** and the upper portion of which runs at an angle with respect thereto upwardly to a first annular groove **17** in the second annular depending flange **12** and positioned just below the point of engagement thereof with respect to the first annular depending flange **11** of the closure.

By referring to FIG. 1 of the drawings, an enlarged vertical section of the tamper indicating closure may be seen to comprise a circular, relatively flat resilient top portion **10**, the relatively short first annular depending flange **11**, which depends from the peripheral edge of the top portion **10**, the second annular depending flange **12**, together with the outturned angular flange **13** and it will be observed that there is a depending annular sealing rib or bead **18** that depends from the circular relatively flat top portion **10** radially spaced inwardly from the first annular depending flange **11** of the closure. The depending annular rib **18** is a slightly elongated, half-circular shape in cross section. The first annular depending flange **11** will be observed to be of smaller diameter than the second annular depending flange **12** and it is provided with an inturned flange **19** which forms a first fastening flange. An oppositely disposed outturned flange **20** defines the difference in diameters of the first annular depending flange **11** and the second annular depending flange **12** and the inturned annular fastening flange **19** being oppositely disposed with respect to the outturned flange **20** stiffens this portion of the closure. The annular depending flange **12** below the outturned flange **20** is formed on a substantially vertical plane of an increased wall thickness with respect to the wall thickness of the first annular depending flange **11** and the circular relatively flat resilient top portion **10** of the tamper indicating closure.

The first annular groove **17** in the second annular depending flange **12** just below the outturned flange **20** being sufficiently deep that it creates a thin frangible connecting wall **21** and thereby defines the tear skirt which comprises all of the second annular depending flange **12** below the first annular groove **17**. There is a

second annular groove 22 in the second annular depending flange which forms a second fastening configuration.

By referring now to FIG. 2 of the drawings, a portion of a container C having a neck N may be seen. The configuration of the neck N having an inturned tapered top flange 23, an annular flat shallow groove 24 on the exterior thereof and spaced downwardly with respect to the upper end of the neck portion of the container and an annular flat wall section 25 immediately therebelow, the lower portion of which joins an outwardly angling section 26 which extends into an annular rib 27. The annular rib 27 and the flat shallow groove 24 of the neck portion of the container form two fastening configurations which register with the second annular groove 22 and the inturned fastening flange 19 respectively of the closure. It will be seen that by simply pushing the closure downwardly on the neck N of the container C brings the dual fastening configurations just described into interlocking relation thus securely positioning the closure on the container neck. At the same time, the depending annular sealing rib 18 on the closure registers with the upper surface of the inturned flange 23 which defines the opening of the neck N of the container.

By referring now to FIG. 3 of the drawings, a vertical section of a portion of the container C and neck N thereof may be seen with the upper portion of the tamper indicating closure positioned thereon in sealing relation. In FIG. 3 of the drawings, the tear skirt, which is the majority of the second annular depending flange 12 has been removed leaving the circular relatively flat resilient top 10 with the first annular depending flange 11 thereon including the oppositely disposed outturned flange 20 and the inturned fastening flange 19 on the lower edge thereof which is illustrated in engagement with the upper portion of the flat shallow groove 24 of the neck portion of the container. The engagement of the depending annular sealing rib 18 with the upper surface of the tapered inwardly extending flange 23 of the neck portion N being maintained.

The engagement of the inturned fastening flange 19 of the closure with the upper portion of the flat shallow groove 24 of the neck portion N is sufficient to hold the closure as shown in FIG. 3 on the container at all times including dropping a container of a one gallon size filled with liquid, such as milk, on a hard surface, such as a floor, from an elevated height. The proximity of the fastening flange 19 to the outturned annular flange 20 limits the distortion of this portion of the closure and thus insures the liquid tight seal which is so highly desirable when the closure in its abbreviated form is replaced on the container.

It will be seen that when the tamper indicating closure disclosed herein is positioned downwardly on the neck of a container such as a blow molded plastic jug, the dual fastening configurations snap into position simultaneously and without interfering with one another. As the closure is moved downwardly over the neck N of the container, the major portion of the second annular depending flange 12 is spaced outwardly or radially of the flat shallow groove 24 and the annular flat wall 25 of the neck portion N so that they do not engage the same, but move downwardly freely until the second annular groove 22 which comprises the second fastening configuration registers with the annular rib 27 of the neck portion N of the container. Simultaneously, the upper portion of the closure has moved downwardly until the inturned annular fastening flange 19 snaps into the upper part of the flat shallow groove 24. The closure is formed of resilient molded plastic material.

It will occur to those skilled in the art that in order to remove the closure from the neck of the container it is necessary to grasp the pull tab 15 as shown in FIG. 4 of the drawings and move it from left to right which causes the lower portion of the annular depending flange 12 of the closure which forms the tear skirt to separate on the line of the groove 17 which is formed in the innner surface of the depending annular flange 12 as hereinbefore described. Continued movement of the pull tab 15 left to right as seen in FIG. 4 of the drawings and thence circumferentially of the closure on the neck portion of the container causes the tear skirt, which is the lower portion of the second annular depending flange 12, to separate the thin connecting wall 21 where it is defined by the first annular groove 17. The annular depending flange 12 below the first annular groove 17 is thus removed completely from the closure leaving the remaining portion of the closure as seen in FIG. 3 complete with its first fastening flange 19 intact upon the neck N of the container. The provision of the outturned flange 17 and the increased diameter of the annular depending flange 12 forms a convenient annular shoulder therebeneath which tapers upwardly and inwardly as best seen in FIG. 3 of the drawings and which is particularly useful in removing the remaining portion of the closure from the neck N of the container as it permits a person's fingers to be positioned thereinunder and the edge of the closure lifted including the necessary distortion of the closure to free the inturned annular fastening flange 19 of the closure from its seat in the groove 24 on the neck of the container.

By referring again to FIG. 1 of the drawings, it will be seen that several circumferentially spaced angularly positioned ribs 28 are illustrated as being formed on the inner surface of the second annular depending flange 12 of the closure and just below the first annular groove 17 which forms the frangible connecting wall 21 therein. These angularly disposed ribs 28 have two functions. When the closure is formed with these ribs 28, they serve to space the second annular depending flange at circumferentially spaced areas with respect to the annular flat wall 25 of the neck N of the container and thus prevent distortion of the same with respect thereto. Secondly, the neck N of the container may be provided with matching rib-like configurations of the annular flat wall 25 as disclosed herein whereupon the ribs 28 may assist the removal of the closure from the neck N of the container by twisting the closure while simultaneously removing the tear skirt portion of the second annular depending flange 12 thereof.

A modification of the closure may be seen in FIGS. 6, 7 and 8 of the drawings wherein a closure including a resilient top portion 29 with a relatively short first annular depending flange 30 has a frangible thin wall 31 joining a tear skirt 32, the lower edge of which has an outturned angular flange 33. Circumferentially spaced gussets 34 join the flange 33 and the tear skirt 32 and maintain the position of the flange 33 when the closures are stripped from the mold. Several depending annular resilient ribs 35 are formed on the lower inner surface of the top portion 29 for sealing engagement with the upper surface of an inturned annular flange 36 which may be tapered as seen in FIGS. 7 and 8 of the drawings.

The several depending annular resilient ribs **35** on the closure top portion **29** are preferably at least cross sectionally half round annular shapes which with the resilient elastic top portion **29** of the closure form a plurality of annular seals on the inturned flange **36** of a blow molded container or bottle. The annular ribs **35** are of different diameters and depend from top portion **28** of the closure in different lengths. The closure seen in FIGS. **6**, **7** and **8** has the same novel dual fastening means for engaging registering dual fastening means on the neck of a container or bottle as hereinbefore described in connection with FIGS. **1-5** of the drawings. These dual fastening means on the closure comprise an inturned flange **37** and an inwardly facing groove **38** separated by another inwardly facing groove **39** which also defines the thin frangible wall **31**. The flange **37** and groove **38** register with a shallow groove **40** and annular rib **41** respectively on the neck N of the container C as seen in FIGS. **7** and **8** of the drawings.

In FIGS. **6** and **7** circumferentially spaced thread-like angular ribs **42** on the inside of the resilient tear skirt **32** of the closure can be engaged on similarly shaped angular ribs which may be formed on the neck N of the container C so that twisting rotary motion applied to the closure will remove it from the neck of the container when the tear skirt **32** is removed.

It will thus be seen that the tamper indicating closure for containers disclosed herein has several points of novelty with respect to the closures heretofore known in the art and in particular those which are primarily adapted for use on blow molded plastic jugs such as used in the dairy industry for the packaging of milk and similar liquid products.

One of the novel features of the invention is the provision of the gussets **14** on the angular flange **13**. The gussets **14** cause the molded closures to freely disengage the mold cavities when formed and eliminate the heretofore sticking of molded closures in the cavities of the multi-cavity molds.

Having thus described my invention, what I claim is:

1. A resilient molded plastic snap on tamper indicating closure and a container, said container including a neck surrounding an opening to the container, the neck defining an inner surface which extends longitudinally of the container, an inturned annular flange which extends radially into the opening and has an outer surface oriented transversely of the neck opening, the flange extending radially into the neck opening beyond the neck inner surface to define an outlet opening which can be off-center with respect to the container neck, and dual closure retaining means on said neck; said dual closure retaining means including a groove defined in said neck adjacent to said inturned annular flange; said closure comprising means for covering said opening to said container and a depending annular flange surrounding said neck, dual fastening means on said depending annular flange for engaging said retaining means and an annular frangible wall formed in said depending annular flange between said dual fastening means, said dual fastening means including a fastening flange located to engage said neck groove; a score line formed in said depending annular flange extending to said annular frangible wall and located adjacent to said fastening flange to define a tear-skirt portion which includes all of said depending annular flange below said fastening flange, said tear-skirt portion having a pull tab affixed thereto, said means for covering said opening to said container comprising a resilient disc having said depending annular flange joined thereto at the peripheral edge of said disc, at least one flexible annular sealing bead integrally formed on said resilient disc in depending relation thereto and postioned for sealing engagement with said inturned annular flange outer surface at a location which is radially inward of the innermost surface of said neck whereby an off-center opening is sealingly covered by said closure.

2. The resilient molded plastic closure and container set forth in claim **1** and wherein there are a plurality of depending annular beads on said means for covering said opening, each of said depending annular beads being of different diameters and different depending lengths.

3. The resilient molded plastic closure and container set forth in claim **1** and wherein said means for covering said opening is of a first thickness and wherein said tear skirt is of a thickness greater than said first thickness of said means for covering said opening whereby said means for covering said opening and the sealing bead thereon are relatively more distortable than said tear skirt.

4. A resilient molded plastic snap on tamper indicating closure for a container of the type having a neck surrounding an opening to the container defined by an inturned annular flange and having dual closure retaining means on said neck, said dual closure retaining means including a groove defined in said neck adjacent to said inturned annular flange; said closure comprising means for covering said opening to said container and a depending annular flange surrounding said neck, dual fastening means on said depending annular flange for engaging said retaining means, said dual fastening means including a fastening flange located on said closure to engage said groove; and an annular frangible wall formed in said depending annular flange between said dual fastening means, a score line formed in said depending annular flange extending to said annular frangible wall and located adjacent to said fastening flange to define a tear-skirt portion which includes all of said depending annular flange below said fastening flange; said tear-skirt portion having a pull tab affixed thereto, said means for covering said opening to said container comprising a resilient disc having said depending annular flange joined thereto at the peripheral edge of said disc, at least one flexible annular sealing bead integrally formed on said resilient disc in depending relation thereto and positioned for sealing engagement with said inturned annular flange, and an outturned angular flange joined to said depending annular flange in oppositely disposed relation to said resilient disc and a plurality of gussets positioned in circumferentially spaced relation to one another between said depending annular flange and said outturned angular flange.

* * * * *

United States Patent [19]

Zumbuhl

[11] **Patent Number: 4,739,893**

[45] **Date of Patent: Apr. 26, 1988**

[54] **LINERLESS PLASTIC CLOSURE WITH INTEGRAL SEALING RING**

[75] Inventor: **Bruno Zumbuhl**, Sugarloaf, Pa.

[73] Assignee: **Zapata Industries, Inc.**, Frackville, Pa.

[21] Appl. No.: **903,501**

[22] Filed: **Sep. 4, 1986**

[51] **Int. Cl.**[4] **B65D 53/00**

[52] **U.S. Cl.** **215/344**; 215/DIG. 1

[58] **Field of Search** ..... 215/344, DIG. 1, 329

[56] **References Cited**

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1107541	5/1961	Fed. Rep. of Germany ... 215/DIG. 1
1213812	11/1959	France .

Primary Examiner—Donald F. Norton

Attorney, Agent, or Firm—Shapiro and Shapiro

[57] **ABSTRACT**

A linerless plastic closure has an integral frusto-conical sealing ring that seals with the rim of the neck of a container when the closure is applied thereto. The sealing ring has a hinge portion at an upper end thereof with a wall thickness that is small relative to that of an adjacent portion of the sealing ring, and has a preformed internal circumferential bead positioned to engage the rim at or near its top inner region. As the closure is applied to the container, the outer portion of the sealing ring first engages the rim, and the sealing ring is easily deformed by virtue of the hinge portion. After the bead seats on the rim, the sealing ring is stretched outwardly completely over the rim, with the bead serving to resist stretching from the hinge portion. An internal circumferential shoulder extends downwardly from the inner surface of the top wall adjacent to the side wall of the closure, engages the outer portion of the sealing ring, shapes the sealing ring to the rim, and clamps the outer portion of the sealing ring to the top outer region of the rim.

9 Claims, 2 Drawing Sheets

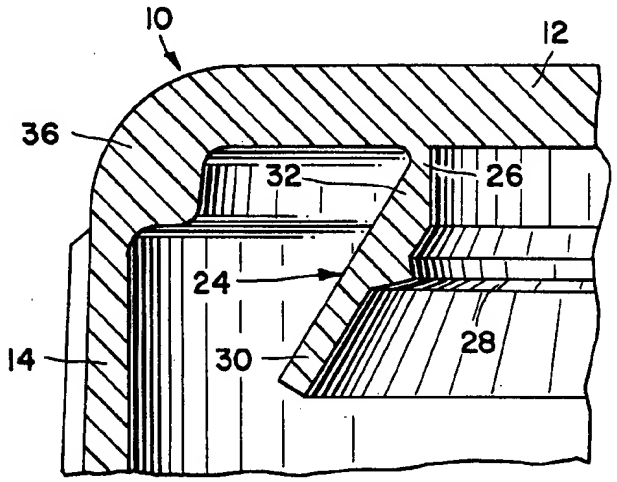


FIG. 1

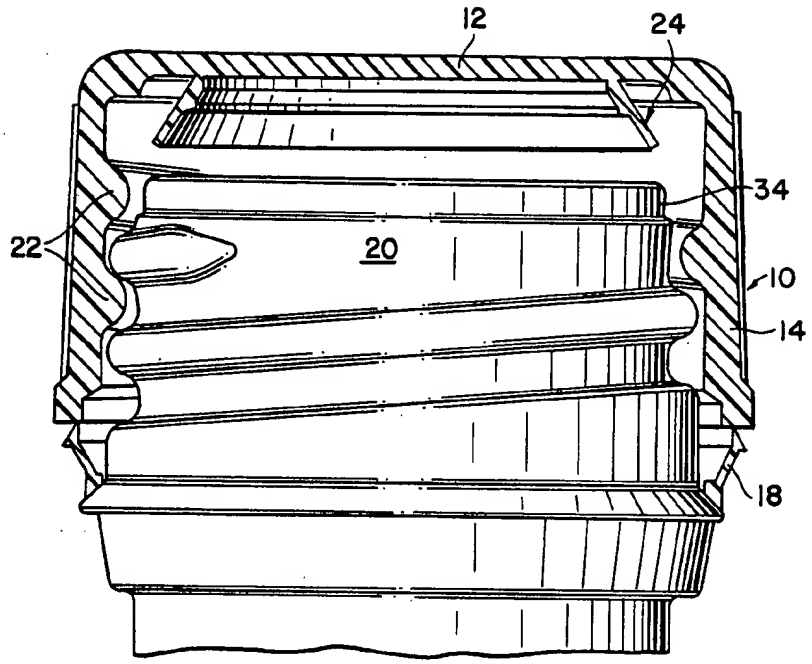


FIG. 2

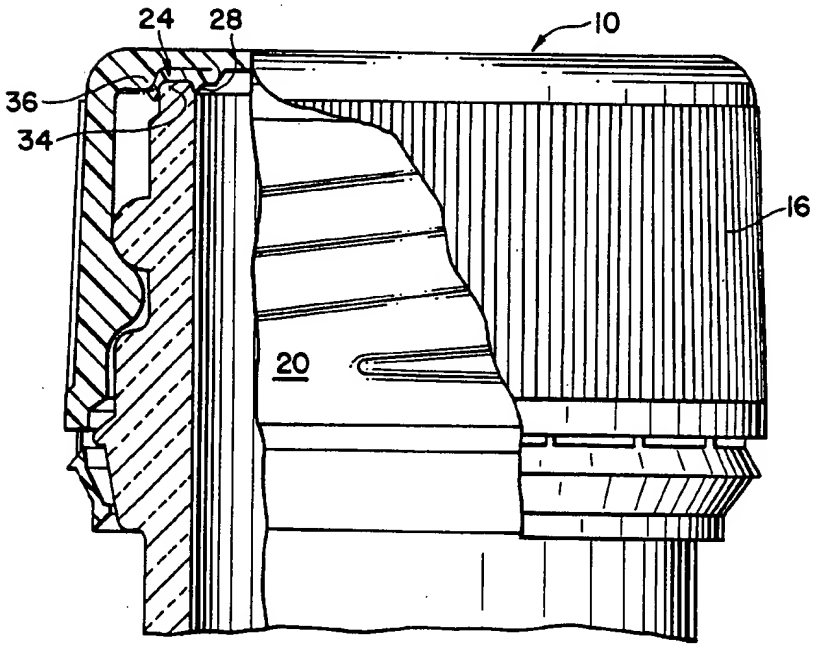


FIG. 3

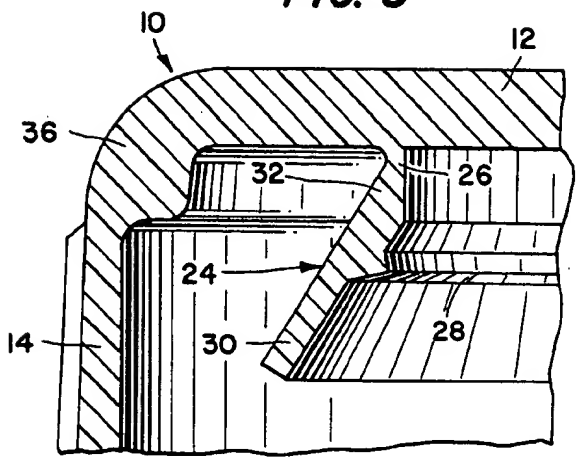
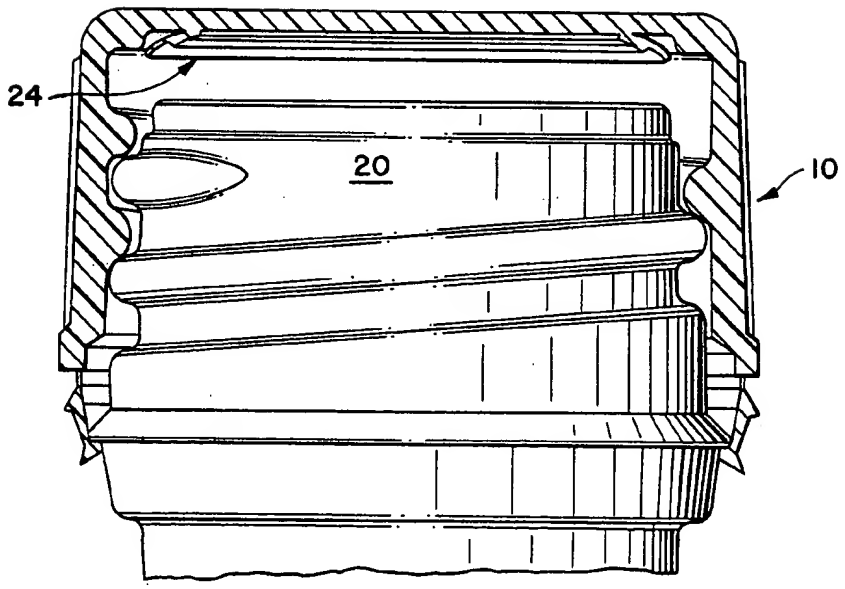


FIG. 4



LINERLESS PLASTIC CLOSURE WITH INTEGRAL SEALING RING

This invention is concerned with linerless plastic closures for containers such as bottles and jars and is more particularly concerned with the provision of an improved fluid-tight seal between the closure and the container.

BACKGROUND OF THE INVENTION

Container closures are well known in which an integral sealing ring, rather than a separate liner or gasket, provides a seal upon the top rim of the neck of a bottle or jar. Such closures, usually referred to as linerless closures or caps, are disclosed, for example, in U.S. Pat. Nos. 3,055,526; 3,203,571; 3,802,590; 3,948,405; 4,072,244; and 4,526,284, and in Austrian Pat. No. 274,657 and French Pat. No. 1,213,812. The sealing ring may be frusto-conical and extend downwardly and outwardly from an inner surface of the top wall of the closure or downwardly and inwardly from that surface. The same general seal configuration may be provided by a separate sealing ring or liner, as disclosed, for example, in U.S. Pat. No. 3,331,523.

Linerless closures are usually molded in one piece from plastic resin, such as polypropylene, polyethylene or other types of plastic material, as disclosed, for example, in the aforesaid U.S. Pat. No. 3,055,526. The rigidity of the closure and its parts may be controlled by the choice of plastic material and by the part thicknesses.

BRIEF DESCRIPTION OF THE INVENTION

The present invention provides an improved linerless plastic closure that is easily applied to a container, that forms a seal with the container that is capable of withstanding high fluid pressures when the closure is initially applied and even after the closure is removed and reapplied, and that can be easily and economically manufactured by injection molding, for example. In one of its broader aspects the invention provides a linerless plastic closure for sealing engagement with the neck of a container having a top rim, the closure comprising a top wall and an integral side wall having means for attaching the closure to the neck of the container, and a frusto-conical sealing ring integral with the top wall and extending downwardly and outwardly from an inner surface thereof, the sealing ring having a hinge portion at an upper end thereof that has small wall thickness relative to the wall thickness of an adjacent portion, and having a preformed internal circumferential bead below the hinge portion positioned to engage the rim of the container neck at or adjacent to a top inside region thereof, the sealing ring also having an outer portion extending downwardly and outwardly from the bead and positioned so as to engage the rim and be stretched over the rim while the bead engaged with the rim resists outward stretching of the sealing ring from the hinge portion.

In another of its broader aspects the invention provides in combination with a container having a neck with a rim at the top thereof, a plastic closure comprising a top wall, a side wall having means for attaching the closure to the neck, and a frusto-conical sealing ring integral with the top wall, the sealing ring extending downwardly and outwardly from an inner surface of the top wall and being positioned to engage the rim of the neck as the closure is applied to the container, the

sealing ring having a hinge portion at an upper end thereof that has wall thickness small relative to the wall thickness of an adjacent portion of the sealing ring, the sealing ring also having a preformed internal circumferential bead positioned to engage the rim at or near the top inner region thereof and having an outer portion extending downwardly and outwardly from the bead and positioned to engage the rim and to be stretched outwardly over the rim, with the bead engaged with the rim resisting outward stretching of the sealing ring from the hinge portion.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be further described in conjunction with the accompanying drawings, which illustrate a preferred (best mode) embodiment and wherein:

FIG. **1** is a vertical sectional view showing a closure in accordance with the invention being applied to the neck of a container;

FIG. **2** is an elevational view, partly broken away and in section, showing the closure after it has been applied to the container;

FIG. **3** is a fragmentary vertical sectional view of the closure prior to its application to the container; and

FIG. **4** is a view similar to FIG. **1** but showing the closure as it is being removed from the container.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

As shown in FIG. **1**, a closure **10** in accordance with the invention comprises a top wall **12** and an integral cylindrical side wall **14**, sometimes referred to as the "skirt." The closure is preferably formed of plastic material molded in one piece, as by injection molding. While polypropylene is the preferred material, other plastics may be used as noted earlier.

The outer surface of the side wall is preferably knurled as shown at **16** in FIG. **2**, and the lowermost portion of the side wall **14** may have an integral tamper-evident ring **18** when this feature is desired. One form of tamper-evident ring, which is attached to the lower edge of the side wall **14** by circumferentially spaced frangible bridges, as well known in the art, is illustrated in the drawings, but the present invention does not require that ring or any ring at all.

The closure of the invention is shown in conjunction with the externally threaded neck **20** of a bottle, which may be a glass bottle manufactured in accordance with GCMI (Glass Container Manufacturers Institute) standards, although closures in accordance with the invention can be used with other types of containers, such as plastic bottles, or jars. An important attribute of the invention is its versatility and adaptability to a wide variety of container types with excellent sealing. For example, the closures of the invention may be used with glass or plastic beverage bottles containing pressurized or unpressurized beverages, or with plastic bottles containing motor oil. In the preferred embodiment illustrated, the inner surface of the side wall **14** of the closure has internal threads **22** that complement the external threads of the neck **20** of the container, so that the closure may be applied to and removed from the container by rotating the closure about its vertical axis, but other forms of attachment of the closure to the container are possible.

As shown in FIGS. **1** and **3**, the closure of the invention has an integral frusto-conical sealing ring **24** extending downwardly and outwardly from an internal

surface of the top wall 12. At the upper end of the sealing ring where it merges with the top wall, the sealing ring has a hinge portion 26 of reduced wall thickness relative to the wall thickness of an adjacent portion of the sealing ring. The sealing ring also has a preformed, integral internal circumferential bead 28 at a lower portion. The bead is preferably of V-shaped cross-section in vertical planes. Incidentally, terms such as "top", "side", "bottom", and "vertical" assume that the parts referred to have the orientations illustrated in the drawings, i.e., with the axes of the closure and the container vertical. Such terms are used for ease of description and are not intended to limit the invention to a particular orientation. As shown in FIG. 3, the sealing ring has an outer portion 30 that extends downwardly and outwardly beyond the bead 28. Preferably the outer portion has a rectangular cross-section in vertical planes, the wall thickness of which is somewhat less than the thickness of the portion 32 between the hinge portion 26 and the bead 28, although variations are possible.

FIG. 1 shows the position of the sealing ring 24 relative to the rim 34 at the top of the neck 20 of the container as the closure 10 is applied to the neck but prior to the formation of a seal. FIG. 2 shows the closure fully engaged with the neck of the container and with the sealing ring 24 engaging the rim 34.

Comparing FIGS. 1 and 2, it will be apparent that the bottom of the outer portion 30 of the sealing ring 24 first engages the top of the rim 34. As the closure continues to be threaded onto the neck 20, the sealing ring is forced downwardly over the rim 34 and is deformed outwardly from the hinge portion 26 so that the rim enters the interior of the sealing ring. This action continues, with outward hinging being provided by the hinge portion 26, which is thin enough to permit easy deformation of the sealing ring. When the closure has been applied to an extent at which the bead 28 engages the rim 34, the bead seats itself at or near the top inner region of the rim as shown in FIG. 2. This engagement of the bead with the rim provides resistance to further stretching from the hinge portion 26, thereby preventing damage to the relatively thin hinge portion, and also forms an excellent seal at the engagement region. Further downward movement of the closure relative to the neck of the container causes the outer portion 30 of the sealing ring to be stretched completely over the rim 34, with the bead 28 anchoring the inner portion 32 of the sealing ring.

As shown in FIG. 3, the closure has an integral internal circumferential shoulder 36 that extends downwardly from the inner surface of the top wall 12 adjacent to the side wall 14, in other words, at the region where the top wall and side wall merge. The cross-section of the shoulder is right-angular in vertical planes. The sealing ring 24 extends outwardly far enough to cause the outer portion 30 to engage the shoulder 36 as the sealing ring is being stretched over the rim 34, thereby shaping the sealing ring to the rim and clamping the sealing ring to the top outer region of the rim, as shown in FIG. 2. A particular virtue of the invention is that sealing is provided over the entire rim from its top inner region to its top outer region, and particularly at the top outer region, which, in accordance with conventional bottle manufacturers' standards, is held closely to a predetermined dimension, unlike the top inner region of the rim. Thus, excellent sealing is provided despite tolerance variations. In actual tests in which closures of the invention have been applied to glass bottles manufactured in accordance with GCMI standards, seals provided in accordance with the invention have remained fluidtight even when the containers to which the closures have been applied have been pressurized to 200 psi.

As is apparent in FIG. 4, which illustrates a closure of the invention partially removed from the neck of a bottle, the sealing ring 24 is permanently deformed by the stretching that occurs during application of the closure to the bottle. Nevertheless, when the closure is reapplied to the bottle, excellent sealing is attained again.

In an actual embodiment, a plastic closure of the invention has a height (exclusive of the tamperevident ring and its bridges) of 0.575 inch, an outer diameter at the top of the side wall of 1.145 inch, an inner diameter at the top of the side wall of 1.095 inch, and a top wall thickness of 0.045 inch. The sealing ring 24 has an inner surface extending vertically downward from the top wall at a top wall diameter of 0.744 inch, the vertical drop being 0.049 inch, at which point the inner surface extends downwardly and outwardly at an angle of 58 degrees with respect to the inner surface of the top wall, the outer surface of the sealing ring extending downwardly and outwardly at the same angle. The length of the sealing ring from its upper end to its lower end is 0.170 inch, and the wall thickness of the outer portion 30 is 0.024 inch. The wall thickness of the hinge portion 26 is 0.010 inch, and the wall thickness of the portion 32 just above the bead 28 is 0.028 inch. The vertex of the bead 28 is 0.007 inch inwardly of the adjacent inner surface of portion 32 and is located 0.032 inch from the point at which the inner surface of the sealing ring commences to extend outwardly. The surfaces of the bead 28 form an angle of 90 degrees.

While a preferred embodiment of the invention has been shown and described, it will be apparent to those skilled in the art that changes can be made in this embodiment without departing from the principles and spirit of the invention, the scope of which is defined in the appended claims.

The invention claimed is:

1. A linerless plastic closure for sealing engagement with the neck of a container having a top rim, the closure comprising a top wall and an integral side wall having means for attaching the closure to the neck of the container, and a frusto-conical sealing ring integral with the top wall and extending downwardly and outwardly from an inner surface thereof, the sealing ring having a hinge portion located at a junction of an upper end thereof with said inner surface, said hinge portion having a wall thickness that is sufficiently small relative to the wall thickness of an adjacent portion of said sealing ring to ensure hinging of said sealing ring at said junction when said closure is applied to the container, said sealing ring having a preformed internal circumferential bead spaced from said hinged portion and positioned to engage said rim of the container neck at or adjacent to a top inside region thereof, said sealing ring also having an outer portion extending downwardly and outwardly from said bead and positioned so as to engage said rim and be stretched over the top and outside of said rim while said bead engaged with said rim resists outward stretching of said sealing ring from said hinge portion.

2. A closure in accordance with claim 1, wherein the closure has an internal circumferential shoulder below

said inner surface of the top wall and adjacent to the side wall of the closure, and wherein the sealing ring extends outwardly sufficiently to engage said shoulder at the outer portion of the sealing ring when the closure is applied to the container so as to shape the sealing ring to said rim and to clamp the sealing ring between the shoulder and the top outer region of the rim.

3. A closure in accordance with claim 1, wherein said bead has a substantially V-shaped cross-section in vertical planes.

4. In combination with a container having a neck with a rim at the top thereof, a plastic closure comprising a top wall, a side wall having means for attaching the closure to the neck, and a frustoconical sealing ring integral with the top wall, the sealing ring extending downwardly and outwardly from an inner surface of the top wall and engaging the rim of the neck, the sealing ring having a hinge portion located at a junction of an upper end thereof with said inner surface, said hinge portion having a wall thickness that is sufficiently small relative to the wall thickness of an adjacent portion of the sealing ring to ensure hinging of said sealing ring at said junction in response to the engagement of said sealing ring with said rim of the neck of the container, the sealing ring also having a preformed internal circumferential bead engaging said rim at or near the top inner region thereof and having an outer portion extending outwardly from the bead and engaging the rim and being stretched outwardly over the top and outside of the rim, with the bead engaged with the rim resisting outward stretching of the sealing ring from the hinge portion.

5. The combination of claim 4, wherein the closure has an internal circumferential shoulder extending downwardly from said inner surface of the top wall adjacent to the side wall of the closure, the sealing ring extending outwardly sufficiently to cause the outer portion of the sealing ring to engage the shoulder, the shoulder shaping the sealing ring to the rim and clamping the outer portion of the sealing ring to the top outer portion of the rim.

6. The combination of claim 4, wherein said bead is spaced from said hinge portion.

7. In combination with a container having a neck with a rim at the top thereof, a plastic closure comprising a top wall, a side wall having means for attaching the closure of the neck, and a sealing ring integral with the top wall, the sealing ring extending downwardly and outwardly from an inner surface of the top wall and engaging the rim of the neck, the sealing ring having a hinge portion extending from a junction of the sealing ring with said inner surface, having a preformed circumferential bead spaced from said junction and engaging said rim at or near the top inner region thereof, and having an outer portion extending outwardly from the bead and being stretched over the top and outside of the rim, with the bead engaged with the rim resisting stretching of said sealing ring between said junction and said bead.

8. The combination of claim 7, wherein the closure has an internal circumferential shoulder extending downwardly from said inner surface of the top wall adjacent to the side wall of the closure, the shoulder engaging the outer portion of the sealing ring, shaping the sealing ring to the rim, and clamping the outer portion of the sealing ring to the top outer portion of the rim.

9. The combination of claim 7, wherein said bead is spaced from said hinge portion.

* * * * *

United States Patent [19]

McBride et al.

[11] **Patent Number: 5,064,084**

[45] **Date of Patent: Nov. 12, 1991**

[54] **COMPOSITE CLOSURE WITH SEAL PROPORTIONING LIP**

[75] Inventors: **Stephen W. McBride**, Brownsburg; **Ralph Whitney**, Indianapolis, both of Ind.

[73] Assignee: **H-C Industries, Inc.**, Crawfordsville, Ind.

[21] Appl. No.: **572,868**

[22] Filed: **Aug. 27, 1990**

[51] **Int. Cl.**[5] **B65D 53/04**

[52] **U.S. Cl.** **215/350**; 215/343; 215/341; 215/252

[58] **Field of Search** 215/341, 343, 345, 350, 215/329, 252, 246

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Primary Examiner—Stephen Marcus
Assistant Examiner—Stephen Cronin
Attorney, Agent, or Firm—Dressler, Goldsmith, Shore, Sutker & Milnamow, Ltd.

[57] **ABSTRACT**

A composite closure with a side seal proportioning lip is disclosed, with the closure including an outer plastic closure cap, and a plastic sealing liner positioned adjacent a top wall portion of the cap. The sealing liner includes a central disc-shaped portion, and an integral relatively thick, annular sealing bead portion. The closure is thus configured to effect a "top/side seal" with an associated container. The construction includes an annular liner-retaining lip having a relatively flexible annular inner edge portion which coacts with the sealing bead portion of the liner to self-adjust and proportion the degree of sealing engagement between the sealing bead portion of the liner and the associated container.

10 Claims, 2 Drawing Sheets

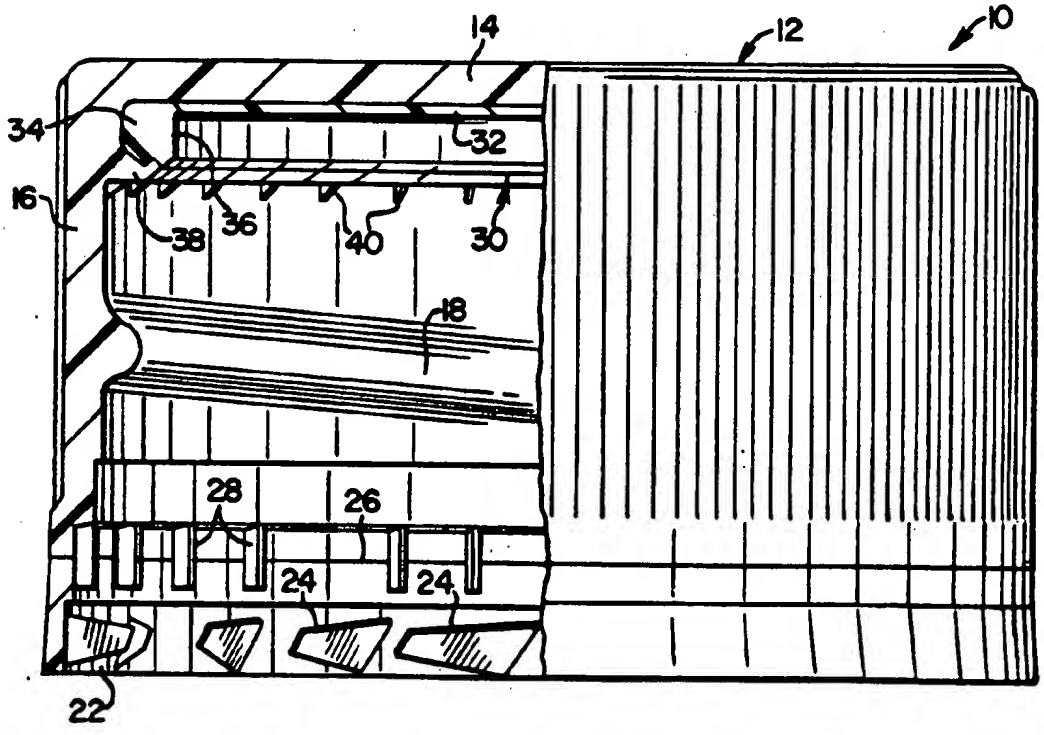


FIG_1

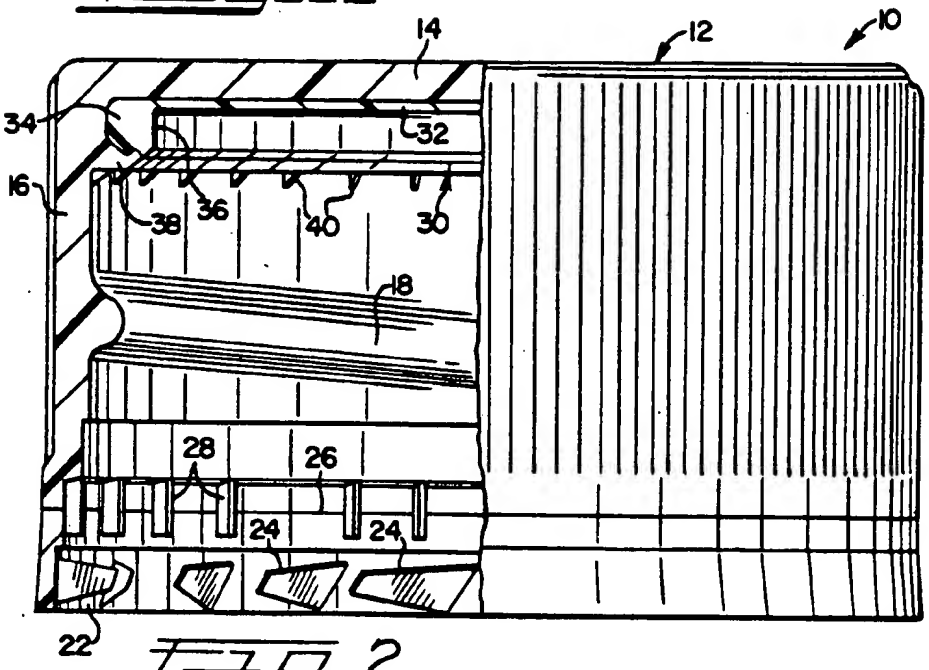


FIG_2

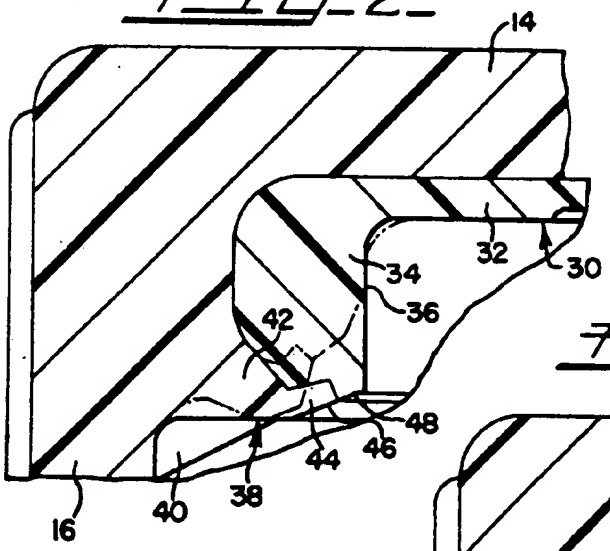
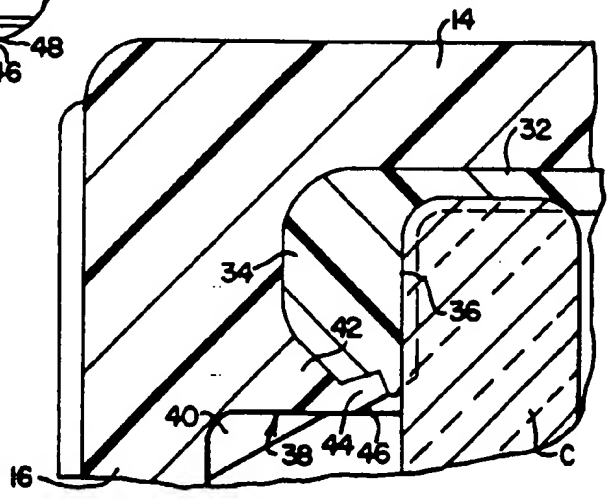


FIG_3



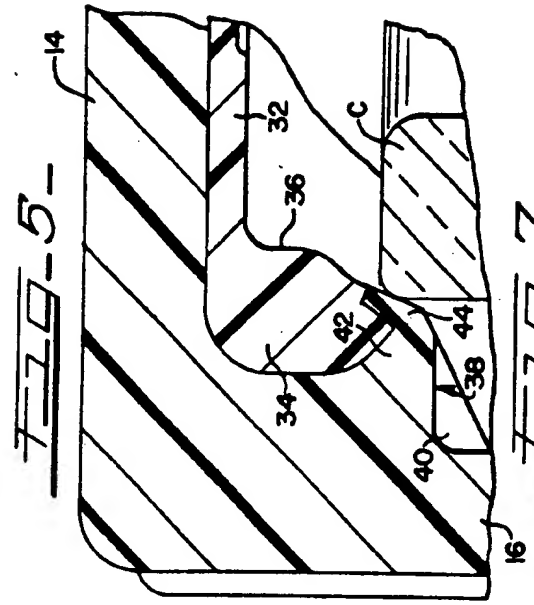


FIG-5-

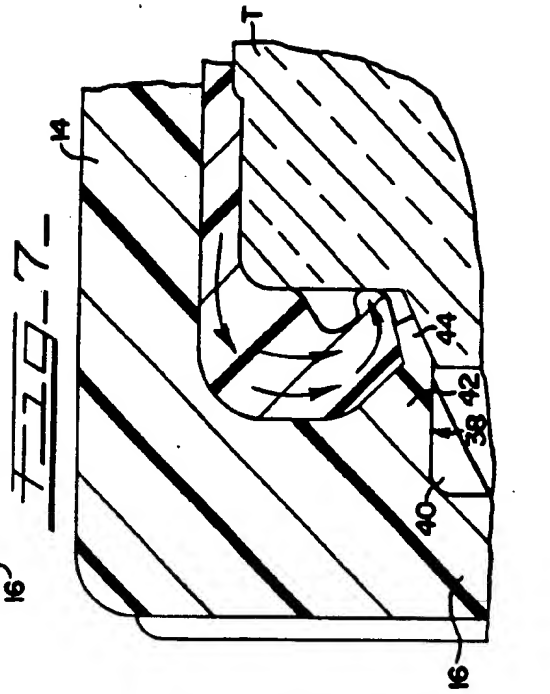


FIG-7-

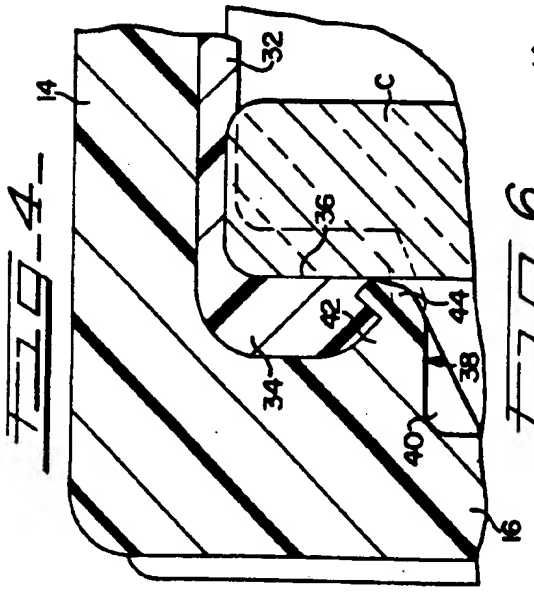


FIG-4-

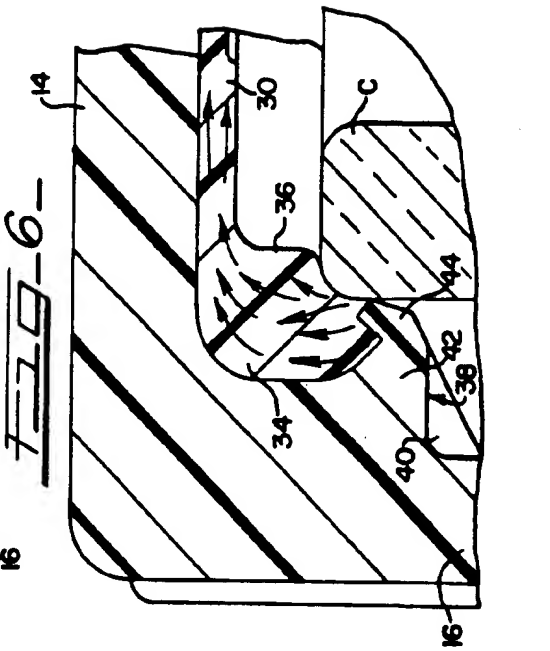


FIG-6-

COMPOSITE CLOSURE WITH SEAL PROPORTIONING LIP

TECHNICAL FIELD

The present invention relates generally to closures which can be sealingly fitted to bottles and like containers, and more particularly to a composite closure including an outer plastic closure cap, and an inner plastic sealing liner, with the cap including a deflectable lip which can deform the sealing liner to obtain the desired sealing engagement with an associated container.

BACKGROUND OF THE INVENTION

Packaging arrangements including a bottle or a like container, and an associated closure fitted thereto, are suitable for a wide variety of goods, in particular liquids such as beverages. In this regard, economical and effective closure constructions for containers including carbonated beverages, wherein the contents are pressurized, have proven challenging to perfect.

U.S. Pat. No. 4,378,893, to Wilde, et al., discloses a composite closure construction which has proven to be very commercially successful due to its high degree of suitability for use on containers having pressurized contents. This construction includes an internally threaded, outer plastic closure cap, with a sealing liner fitted in the closure cap adjacent to a top wall portion thereof. U.S. Pat. Nos. 4,343,754 and 4,497,765 disclose methods and apparatus for effecting efficient manufacture of this type of closure.

One particularly advantageous feature of this type of closure is the nature of its sealing arrangement. Specifically, the generally disc-shaped sealing liner of the closure includes an annular sealing bead portion which defines a generally inwardly facing sealing surface. By this arrangement, a so-called "top/side" seal is formed with the associated container, that is, sealing engagement is effected at both the upwardly facing top surface, and outwardly facing side surface of the container.

Experience has shown that the internal gas pressure of a container having a carbonated beverage or the like can act against the inside of the top wall of this type of closure, thereby acting to deform or bow the top wall upwardly. While this cold-flow phenomenon (sometimes referred to as "creep" of the plastic material) can lessen the sealing engagement of the closure with the top surface of the container, the combination top/side seal assures that the side seal is maintained, thus maintaining the sealing integrity of the construction.

Despite the desirable functional characteristics of this construction, certain conditions can detract from its effectiveness. One potential problem concerns the inevitable manufacturing tolerances encountered in container manufacture, wherein a closure may be fitted to either a relatively small or relatively large container. Similar containers made from different materials may also exhibit dimensional differences in their finishes.

The side seal of the closure is generated by compression of the liner material at the inside diameter of the annular sealing bead portion when the closure is applied to a bottle finish. The amount of liner compression is determined by the outside diameter of the bottle finish relative to the inside diameter of the sealing bead portion.

To form an effective seal, the relatively low compression of the liner material at the side seal by a smaller diameter bottle requires that the length (i.e., height) of the side seal be relatively long. In contrast, high compression of the liner material by a relatively large diameter bottle only requires a short side seal length to assure the desired sealing.

Accordingly, it is desirable to provide an arrangement which is configured to change the side seal length depending upon the finish diameter of the container to which the closure is fitted.

In addition to providing the desired degree of sealing engagement between the closure and the associated container, a closure should preferably be configured to facilitate high-speed, automatic application. As noted, a container having a relatively large outside diameter results in relatively high compression of the liner material attendant to closure application, and providing an arrangement which facilitates such application is desirable.

One undesirable result of the compression of the closure liner material can be an extrusion-like deformation of the material so that it tends to move past the annular retaining lip down the side wall of the bottle finish. This can have the undesirable effect of increasing the so-called vent release angle of the closure. Specifically, for threaded closures used on carbonated beverages, it is ordinarily desirable to facilitate the venting of gas pressure from within the container prior to release and disengagement of the closure threads. Under those conditions where the liner material has extruded past the retaining lip, the angle through which the closure must be rotated to release the seal, and thus initiate venting, can be undesirably increased, thereby decreasing the amount of rotation between initiation of venting and disengagement of the threads. Accordingly, it is desirable to minimize such extrusion of the liner material past the retaining lip.

Finally, it is generally desirable to enhance the efficiency of closure manufacture. As disclosed in the above-noted patents, closures of the subject type are formed by in situ compression molding of the liner material by depositing a pellet of molten plastic in the closure cap, and thereafter compressing and molding the molten material so that it flows against the annular liner retaining lip and forms the sealing liner.

To assure that the lining material is confined generally within the region defined by the annular lip, the use of an annular sleeve, which fits about the liner-shaping molding plunger, is preferred. This annular sleeve engages the annular lining retaining lip as the liner material is molded, thereby acting to confine the material as desired.

Problems can arise when attempting to line relatively hot and pliable closure caps. Experience has shown that under these conditions, the liner material can be forced past the relatively pliable retaining lip of the closure cap, resulting in plastic "flash" around the lip. This is undesirable because it can undesirably increase the vent release angle of the closure, and detracts from the aesthetic aspects of the construction.

With consideration of the above design problems, the present closure has been particularly configured to provide the desired degree of sealing for closures exhibiting varying diameters within normal tolerances, while at the same time providing consistent venting characteristics. High-speed manufacture and application are desirably accommodated.

SUMMARY OF THE INVENTION

In accordance with the present invention, a composite closure is disclosed which includes an outer plastic closure cap having an annular liner-retaining lip, and a plastic sealing liner positioned adjacent a top wall portion of the closure. Notably, the annular lip of the closure cap is configured to deform the sealing liner to thereby provide a self-adjusting or self-proportioning cooperation with the liner attendant to application to a container, whereby the degree of sealing engagement with the associated container is automatically varied. At the same time, the configuration of the lip promotes high-speed application by acting to guide the closure onto the container, with the arrangement further facilitating consistent high-speed manufacture and lining of the closure.

The composite closure of the present invention includes a plastic outer closure cap having a top wall portion, an annular skirt portion depending from the top wall portion, and an annular liner-retaining lip which projects inwardly from the annular skirt portion in closely spaced relation to the top wall portion. In the illustrated embodiment, the skirt portion includes an internal thread formation, and a plurality of axially extending vent grooves to facilitate the release of gas pressure when the closure is fitted to a container having carbonated contents.

The closure further includes a plastic sealing liner positioned adjacent the top wall portion which is retained in the closure cap by the annular lip. The sealing liner is preferably compression molded in situ to a disc-shaped configuration, and includes an annular sealing bead portion positioned adjacent the annular lip. The annular sealing bead portion defines a generally inwardly facing sealing surface, with the liner thus configured to provide a so-called top/side seal with an associated container. The side sealing action is provided by the engagement of the inwardly facing sealing surface of the bead portion with the associated container.

In accordance with the present invention, the annular lip of the closure cap is configured to coact and cooperate with the annular bead portion of the liner to provide a self-adjusting or self-proportioning action. Specifically, the annular lip is deflectable so as to deform the annular sealing bead portion of the liner, and thereby proportion the degree of sealing engagement of the inwardly facing sealing surface of the bead portion with the associated container. This effect is achieved by configuring the annular lip to include a relatively flexible and deflectable inner edge portion which can move and flex under the influence of a container having a sufficiently large diameter so as to engage this portion of the annular lip.

In the illustrated embodiment, the annular lip further includes a relatively inflexible base portion positioned adjacent the skirt portion of the closure cap, with the deflectable inner edge portion extending inwardly of the base portion. By deflection of the inner edge portion relative to the skirt portion of the closure, the bead portion of the sealing liner is deformed. In this manner, a relatively large container (which subjects the liner to high compression) acts to deform the liner and shorten the length of the side seal, while a relatively smaller container (which subjects the liner to relatively low compression) subjects the lip to little or no deflection, whereby a relatively long side seal is formed.

In the preferred form, the annular lip of the closure cap facilitates high-speed closure application. To this end, the lip defines an annular guide surface facing generally away from the top wall portion of the closure, with this surface acting to guide the closure onto the container for sealing engagement of the inwardly facing sealing surface with the container. In the illustrated embodiment, this guide surface is provided on the deflectable, inner edge portion of the annular lip, and is of a frusto-conical configuration so that the surface converges inwardly toward the top wall portion of the closure.

To further facilitate application, the sealing liner of the closure preferably defines a frusto-conical annular surface which extends between the free edge of the deflectable inner edge portion of the annular lip, and the inwardly facing sealing surface of the bead portion of the liner. In the preferred form, this annular surface of the liner converges inwardly toward the top wall portion at the same angle as the guide surface of the annular lip, and is preferably adjacent and abutting to the lip guide surface so that the annular surface of the liner is a continuation thereof. In the most preferred form, the two frusto-conical annular surfaces collectively define a generally continuous frusto-conical surface, which acts in a ramp-like fashion to guide the closure onto the container and establish the desired sealing engagement between the inwardly facing sealing surface of the liner and the container.

Other features and advantages of the present invention will become readily apparent from the following detailed description, the accompanying drawings, and the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view in partial cross-section of a composite closure embodyinq the principles of the present invention;

FIG. 2 is a fragmentary, relatively enlarged view illustrating the side seal proportioning lip of the present composite closure;

FIGS. 3 and 4 are views similar to FIG. 2 illustrating the manner in which the seal proportioning lip of the present construction cooperates with containers having varying dimensions;

FIG. 5 is a view similar to FIG. 2 illustrating the manner in which the seal proportioning lip of the present construction facilitates high-speed closure application, particularly to a relatively large container;

FIG. 6 is a view similar to FIG. 5 further illustrating application of the present closure to a relatively large container; and

FIG. 7 is a fragmentary view illustrating formation of the present composite closure.

DETAILED DESCRIPTION

While the present invention is susceptible of embodiment in various forms, there is shown in the drawings and will hereinafter be described a presently preferred embodiment, with the understanding that the present disclosure is to be considered as an exemplification of the invention, and is not intended to limit the invention to the specific embodiment illustrated.

With reference now to FIG. 1, therein is illustrated a composite closure 10 embodying the principles of the present invention. As will be further described, the closure 10 is particularly configured for use in connection with an associated container C, such as a bottle or

the like, and is particularly effective for use with carbonated beverages or like pressurized contents.

A composite closure embodying the present invention may be formed in accordance with the teachings of U.S. Pat. Nos. 4,343,754 and 4,497,765, which are incorporated herein by reference. In accordance with the teachings of these patents, composite closure 10 can be efficiently formed by compression molding, including compression molding of the outer plastic closure cap, and in situ compression molding of the sealing liner of the construction.

In the illustrated embodiment, closure 10 includes a generally cup-like plastic closure cap or shell 12 having a circular top wall portion 14, and a cylindrical, annular skirt portion 16 depending from the top wall portion. Skirt portion 16 is preferably provided with an internal thread formation 18, which is configured to mate with a like thread formation on an associated container C.

In the illustrated embodiment, the closure 10 includes a tamper-evident feature, comprising an annular pilfer band 22 depending from skirt portion 16. The pilfer band includes a plurality of inwardly extending flexible projections 24 which are configured to coact with the finish of the container C during removal of the closure from the container. The pilfer band 22 is distinguished from the skirt portion 16 of the closure by a circumferentially extending score line 26 which extends through the side wall portion of the closure cap. The pilfer band 22 is at least partially detachably connected to the skirt portion 16 by a plurality of circumferentially spaced frangible bridges 28 which extend between the inside surfaces of the skirt portion and the pilfer band. A tamper-evident feature such as illustrated can be formed in accordance with the teachings of U.S. Pat. No. 4,418,828. Alternately, a pilfer band may be configured in accordance with the teachings of U.S. Pat. No. 4,938,370.

Composite closure 10 is composite in nature in that it includes the outer closure cap 12, and a sealing liner 30 which is preferably compression-molded in position in the closure cap 12. The sealing liner is configured to create a so-called "top/side seal" in association with the container C. Such a seal effects sealing engagement with both the generally upwardly facing surface of the container C, as well as with the generally outwardly facing surface thereof. This type of seal has proven particularly effective with containers having carbonated contents, since even though internal gas pressure (acting against the inside top surface of the closure) can affect the sealing engagement of the liner at the top of the container, the sealing integrity of the arrangement at the side of the container is maintained.

To provide this type of sealing arrangement, the sealing liner 30 includes a generally disc-shaped central portion 32, and an integral, relatively thick annular sealing bead portion 34. The sealing bead portion 34 defines a generally vertical, generally inwardly facing sealing surface 36 which effects the side seal of the closure, with the central portion 32 providing the desired top seal.

In accordance with the present invention, the closure cap 12 includes an annular liner-retaining lip 38 which projects inwardly from the annular skirt portion 16 of the closure in closely spaced relation to the top wall portion 14. A plurality of circumferentially spaced gussets 40 can be provided extending between the skirt portion 16 and the annular lip to enhance the rigidity of the base portion of the annular lip 38. As will be further described, annular lip 38 has been particularly configured in accordance with the principles of the present invention to provide a self-adjusting or proportioning action by deforming the sealing liner 30 (as generally illustrated in phantom line in FIG. 2), whereby the degree of sealing effected by the inwardly facing side seal surface 36 is automatically varied when fitted to containers having varying dimensions.

As noted, the present type of closure has proven effective on containers having carbonated contents, in part because the construction can accommodate the normal manufacturing tolerances which result in varying dimensions for containers to which the closures are fitted. Ordinarily, such varying dimensions are accommodated by subjecting the sealing liner of the closure to either a lesser or greater degree of compression during application. Application is facilitated by the formation of a frusto-conical surface on the sealing liner which extends between its inwardly facing sealing surface and the associated annular lip.

The closure of the present invention is configured to further enhance the performance of this type of closure when fitted to containers exhibiting normal manufacturing dimensional tolerances. To this end, the annular lip 38 has been specifically configured in a generally compound configuration, including a relatively rigid and inflexible base portion 42 adjacent the skirt portion of the closure, and a relatively flexible inner edge portion 44 extending inwardly of the base portion 42.

The inner edge portion 44 is relatively thinner in cross-section than the base portion 42, and has a generally inwardly tapering or converging shape. By virtue of the rigidification of the base portion 42 by the gussets 40, the inner portion 44 tends to flex and deform, relative to the base portion, generally at the inner junctions of the gussets with the lip 38. Thus, in the illustrated construction including gussets 40, the flexible inner portion 44 of the lip 38 is generally defined as that portion of the lip extending inwardly of the gussets.

In the preferred form, the inner edge portion 44 defines a frusto-conical guide surface 46 (FIGS. 2, 3) which faces generally away from the top wall portion 14 of the closure cap, and converges inwardly toward the top wall portion. Most preferably, the sealing liner 30 includes a frusto-conical annular guide surface 48 (FIG. 2) which also converges inwardly toward the top wall portion and is preferably configured generally as a continuation of the annular guide surface 46, whereby the guide surface 46 and the guide surface 48 collectively define a frusto-conical surface.

The self-adjusting and proportioning action of the present sealing construction is illustrated in FIGS. 3 and 4. In FIG. 3, the present closure is illustrated being fitted to a container C having a relatively small outside diameter, with the original configuration of the sealing liner 30 being illustrated in phantom line.

As will be observed, the relatively low degree of interference between the relatively small container and the sealing liner 30 results in relatively light compression of the liner at both its top and side sealing regions. In view of this, it is preferred that a relatively long (referring to the axial extent) side seal be formed. This is achieved since the annular lip 38 is dimensioned so that compression and deformation of the sealing liner 30 takes place with little or no engagement of the container with the annular lip 38, and thus little or no deformation of the liner by deflection of edge portion 44.

FIG. 4 illustrates the manner in which the present closure acts to proportion the degree of sealing engagement of the inwardly facing sealing surface 36 of the liner 30 with a container having a relatively large outside diameter. Again, the original disposition of the sealing liner (and annular lip) are illustrated in phantom line.

In view of the relatively high degree of interference which is created between this large container and the sealing liner, it is preferred that a relatively short seal length be created between the inwardly facing surface 36 and the outwardly facing surface of the container. This is achieved by the coaction of the container with the relatively flexible outer edge portion 44 of the annular lip 38, which in turn acts to shape and deform the annular sealing bead portion 34 of the liner 30.

Specifically, and as illustrated in FIGS. 5 and 6, application of the closure to this relatively large container results in engagement of the container with the relatively flexible outer portion 44 of the annular lip, which in turn initiates compression and deformation of the liner prior to engagement of the liner with the container. By this action, the side sealing surface at 36 is effectively shortened, with compression of the liner by both the annular lip and the container acting to force the lining material toward the center of the closure. The eventual result is illustrated in FIG. 4. It will be noted by comparison to FIG. 3, that the engagement of the inwardly facing surface 36 is significantly less with the relatively large container of FIG. 4 than with the relatively small container of FIG. 3.

Several other advantages provided by the present sealing construction should be noted in FIGS. 4–6. The preferred provision of annular guide surfaces 46 and 48 assist in guiding the closure into position for the desired sealing engagement with the container C. The guide surface 46 of the relatively flexible inner edge portion 44 of the annular lip desirably acts to compress and shape the liner as the closure is applied, with the preferred frusto-conical configuration providing the desired action.

In view of this action, a sufficiently large entrance angle for accommodating the relatively large container is automatically created at the sealing surface 36, thereby obviating the need to form the annular surface 48 of the liner with a steeply sloped configuration. Resort to relatively steeply angled lead-in surfaces on the liner can be counterproductive. A steep angle results in a relatively short, low compression side seal on a small container, and a relatively long, high compression seal on a large container, contrary to the desired effect, which is achieved with the present invention. The illustrated arrangement thus acts to assure the desired application and engagement, even though the physical interference and friction between the container and the closure may be relatively high.

As noted, the present construction functions such that during application to a relatively large container, the resultant high compression of the liner material acts to displace the liner material generally toward the center of the closure. The engagement between the relatively flexible inner edge portion of the annular lip 38 and the container desirably acts to provide a relatively tight hoop seal to confine the liner material in the region at which the side and top seals are intended to be formed. This arrangement desirably acts to abate and prevent any extrusion of the liner material downwardly between the annular lip and the container finish, which extrusion can sometimes occur in known constructions. Such extrusion can act to increase the degree of rotation which is required for releasing the seal of the closure (sometimes referred to as the vent release angle) thereby decreasing the degree of rotation between initiation of gas venting, and disengagement of thread formation 18 from the container threads. Since gas venting is preferably completed prior to disengagement of the threads, the present construction desirably acts to assure that venting is initiated when intended, thereby acting to assure completion of venting prior to thread disengagement.

A further advantage of the present construction concerns in situ liner formation. Liner formation is effected by depositing a molten pellet of liner-forming material in the closure cap, preferably with the top wall portion 14 positioned downwardly, with the liner material thereafter compressed to mold it to the configuration of the liner. During this process, a central liner-forming plunger is employed, with a concentric sleeve disposed thereabout for engagement with the annular lip of the closure.

Experience has shown that in current forms of the present type of composite closure, the outer closure cap is preferably cooled for a relatively extended period prior to in situ liner formation. Ordinarily, attempts at lining closure shells while they are still relatively hot from the molding operation can result in plastic flashing around the annular lip of the closure shell, which is believed to result from the lip being pliable and not sufficiently cool as to exhibit sufficient rigidity to resist the liner-forming pressures without undesired deformation.

As illustrated in FIG. 7, the configuration of the present closure cap 12, including the compound annular lip 38, desirably addresses this problem by providing relatively greater surface area for the molding tooling T to seal against, with the lip acting to redirect the flow of molten liner material inwardly. It is believed that this causes some of the liner material to prematurely "freeze off" or solidify before the end of the liner-shaping process. The molten liner material following the solidified material meets with more resistance as it compresses toward the annular lip 38, and the associated liner forming tooling sealing surfaces. Thus, manufacturing efficiency is enhanced, since the need for an extended cooling period for the outer cap prior to lining is avoided.

From the foregoing, it will be observed that numerous modifications and variations can be effected without departing from the true spirit and scope of the novel concept of the present invention. No limitation with respect to the specific embodiment illustrated herein is intended or should be inferred. The disclosure is intended to cover by the appended claims all such modifications as fall within the scope of the claims.

What is claimed is:

1. A composite closure for a container, comprising:

an outer closure cap having a top wall portion, an annular skirt portion depending from said top wall portion, and annular liner-retaining lip means projecting inwardly from said annular skirt portion in closely spaced relation to said top wall portion; and

a sealing liner positioned adjacent said top wall portion and retained by said annular lip means, said sealing liner including an annular sealing bead portion positioned adjacent said annular lip means and having a generally inwardly facing sealing surface,

said lip means defining an annular guide surface means facing generally away from said top wall portion for guiding said closure onto the associated container for sealing engagement of said inwardly facing sealing surface with the associated container,

said sealing bead portion of said liner defining an annular surface extending between said annular guide surface means and the inwardly facing sealing surface of said bead portion, said guide surface means converging inwardly and upwardly toward said top wall portion, said annular surface of said sealing liner converging inwardly and upwardly toward said top wall portion and comprising a continuation of the inwardly converging annular guide surface means of said annular lip means to define a frusto-conical surface therewith.

2. A composite closure for a container, comprising:

an outer closure cap having a top wall portion, an annular skirt portion depending from said top wall portion, and annular liner-retaining lip means projecting inwardly from said annular skirt portion in closely spaced relation to said top wall portion; and

a sealing liner positioned adjacent said top wall portion and retained by said annular lip means, said sealing liner including an annular sealing bead portion positioned adjacent said annular lip means and having a generally inwardly facing sealing surface,

said lip means being deflectable to deform said annular sealing portion of said liner to thereby proportion the degree of sealing engagement of said inwardly facing sealing surface of said liner with the associated container,

said annular lip means comprising a base portion positioned adjacent said skirt portion, and a relatively flexible and deflectable inner edge portion extending inwardly of said base portion, said inner edge portion being deflectable relative to said skirt portion upon engagement with the associated container for deforming said sealing bead portion of said liner, said annular lip means defining an annular guide surface facing generally away from said top wall portion, said guide surface converging inwardly and upwardly toward said top wall portion, and being engageable with the associated container.

3. A composite closure in accordance with claim 2, wherein

said sealing bead portion of said liner defines an annular surface extending between said annular guide surface of said lip means and the inwardly facing sealing surface of said bead portion.

4. A composite closure in accordance with claim 2, wherein

said inner edge portion of said lip means is relatively thinner than said base portion and has a generally inwardly tapering shape.

5. A composite closure in accordance with claim 2, including

a plurality of circumferentially spaced gussets extending between said skirt portion and said annular lip means, said relatively flexible inner edge portion comprising that portion of said lip means extending inwardly of said gussets.

6. A composite closure for a container, comprising:

an outer closure cap having a top wall portion, an annular skirt portion depending from said top wall portion, and annular liner-retaining lip means projecting inwardly from said annular skirt portion in closely spaced relation to said top wall portion; and

a sealing liner positioned adjacent said top wall portion and retained by said annular lip means, said sealing liner including an annular sealing bead portion positioned adjacent said annular lip means and having a generally inwardly facing sealing surface,

said lip means being deflectable to deform said annular sealing portion of said liner to thereby proportion the degree of sealing engagement of said inwardly facing sealing surface of said liner with the associated container,

said annular lip means comprising a base portion positioned adjacent said skirt portion, and a relatively flexible and deflectable inner edge portion extending inwardly of said base portion, said deflectable inner edge portion having an upwardly and inwardly converging annular surface facing generally toward said top wall portion and engaging said annular sealing bead portion of said liner, said inner edge portion being deflectable relative to said skirt portion upon engagement with the associated container for deforming said sealing bead portion of said liner.

7. A composite closure in accordance with claim 6, wherein

said annular lip means defines an annular guide surface facing generally away from said top wall portion, said guide surface converging inwardly and upwardly toward said top wall portion, and being engageable with the associated container.

8. A composite closure in accordance with claim 7, wherein

said sealing bead portion of said liner defines an annular surface extending between said annular guide surface of said lip means and the inwardly facing sealing surface of said bead portion.

9. A composite closure in accordance with claim 6, wherein

said inner edge portion of said lip means is relatively thinner than said base portion and has a generally inwardly tapering shape.

10. A composite closure in accordance with claim 6, including

a plurality of circumferentially spaced gussets extending between said skirt portion and said annular lip means, said relatively flexible inner edge portion comprising that portion of said lip means extending inwardly of said gussets.

* * * * *

US006021912A

United States Patent [19]

Hertrampf

[11] **Patent Number: 6,021,912**

[45] **Date of Patent: Feb. 8, 2000**

[54] **CLOSURE FOR A BOTTLE OR THE LIKE**

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[73] Assignee: **Safety Cap Systems AG**, Ch-Biel-Benken, Switzerland

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[86] PCT No.: **PCT/EP96/04646**

§ 371 Date: **Apr. 17, 1998**

§ 102(e) Date: **Apr. 17, 1998**

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PCT Pub. Date: **May 9, 1997**

[30] **Foreign Application Priority Data**

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Apr. 6, 1996 [DE] Germany 196 13 830

[51] **Int. Cl.**[7] **B65D 51/16**; B65D 53/02

[52] **U.S. Cl.** **215/344**; 215/260; 215/270; 215/345

[58] **Field of Search** 215/344, 260, 215/270, 271, 311, 307, 329, 341, 343, 354, 902, 345; 220/203.01, 203.09, 203.29, 303

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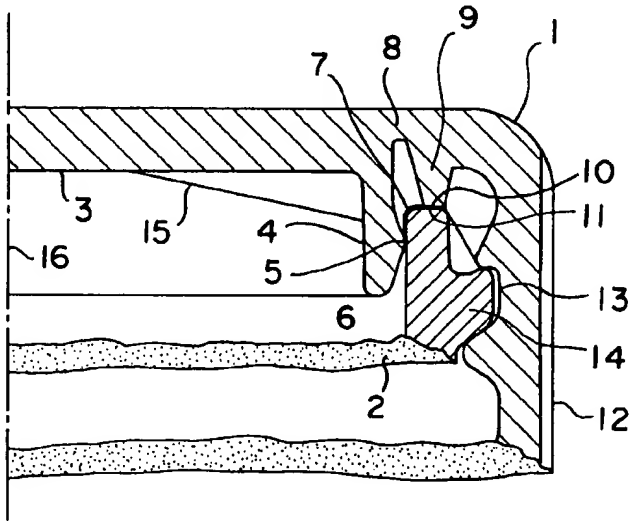
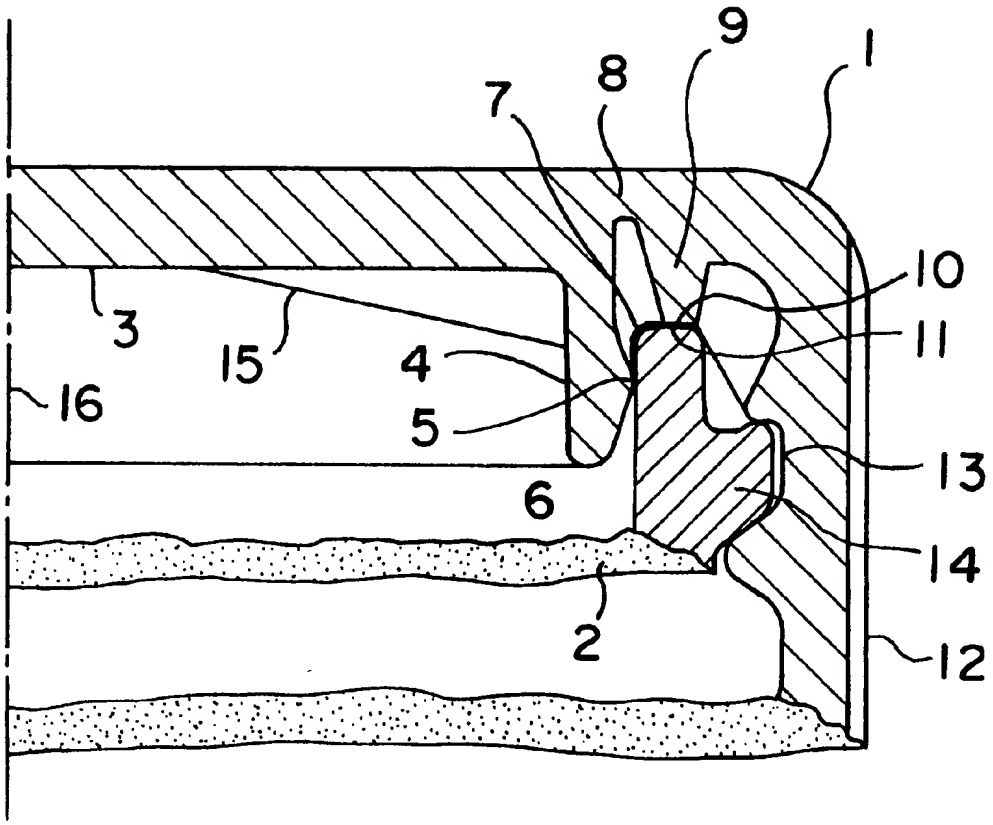
[57] **ABSTRACT**

A closure for a bottle, comprising a cap-shaped closure component; a projection directed inwardly from an edge of the cap-shaped closure component to grip behind an outwardly directed projection at a neck of a bottle; a substantially cylindrical sealing element extending axially from a bottom of the closure component, the sealing element being disposed within the closure component; and a radial projection formed outside of the sealing element and disposed away from the bottom and having a diameter larger than the inside diameter of the neck of the bottle to be sealed by the closure means in such a way that a sealing surface formed by the radial projection tightly rests against an inside surface of the neck in a closed mode. The bottom comprises a cross-sectional slimming disposed radially beyond the cylindrical sealing element, the slimming having a thickness less than the thickness of an adjacent portion of the bottom such that the slimming functions as a hinge. The bottom and the sealing element form an elbow lever pivotable about the hinge. At least one rib is disposed in a space formed between the bottom and the sealing element to brace the sealing element against movement relative to the bottom, such that upon bulging of the bottom the radial projection is substantially radially detached from the inside surface of the neck by a lever action of the elbow lever pivotable about the hinge.

7 Claims, 1 Drawing Sheet

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CLOSURE FOR A BOTTLE OR THE LIKE

FIELD OF THE INVENTION

The invention concerns a closure means for a bottle or the like.

BACKGROUND OF THE INVENTION

The British patent document 2,013,635 A discloses a closure means of this kind wherein the radial projection rests against the inside wall of the bottle neck in the immediate vicinity of its own orifice rim. The cylindrical sealing element is very short and the outside of the projection lies closely to the bottom of the cap-shaped closure component. The bottom bulges outwardly in case of overpressure. When deforming in this convex manner, the sealing projection follows said mainly axially directed bulging until, at a given overpressure and hence at a given bulge, it is released from in the inner mouth rim of the bottle's neck and in this manner subtends gap through which the overpressure may be relieved. In this manner the said sealing means forms an overpressure valve averting bottle bursting and entailed dangers.

This known closure means incurs a drawback in that in practice the front inner rim at the mouth of the bottle neck demands high precision of manufacture, so that no defined rest of the sealing projection is assured exactly in the critical range wherein the overpressure valve formed by the closure means shall open and close. In addition, as regards such bottles, and especially those glass bottles to be reused several times, the inner rim edge of the bottle neck is damaged and thus will not be sealing.

Another drawback of this known closure means is that on account of pressure changes arising in practice by heating and then cooling the contents of the bottle fitted with said closure means, the sealing projection steadily slides in the axial direction on the inside surface of the mouth of the bottle acting as a valve seat, whereby the sealing surface of the projection may be abraded or damaged and then be leaking.

Lastly the known closure means incurs the drawback that the necessity of axial displacement in turn requires axial yielding by the cap outside the cylindrical sealing element. This requirement is met in this known closure means embodied by a screw cap by shearing the bottom outside the cylindrical sealing element and by axially stretching the outer cylindrical part. However said stretching includes prestressing which in turn depends on the screw-on torque, in any event it depends during customer use on the particular torque applied by the user in screwing on the screw cap. Consequently the pressure at which for safety reasons there shall be pressure relief will not be provided with the desired reliability to preclude bottle bursting at excessive pressure.

The British patent document 958,417 discloses a closure means of a similar kind, also in the form of a screw cap fitted with projections inside its bottom and serving as stops and coming to rest against the rim edge of a bottle neck when said cap is being screwed onto it. In this design the stretching of the outer cap part comprising the thread is not utilized to impart axial displaceability to the bottom. The elasticity of this axial displaceability being determinant for the opening pressure, whereas only the region between the cylindrical sealing element and the outer rim of the top end of the bottle neck are available for yielding, the bottom must be made very thin to achieve adequately elastic yielding. This feature is a drawback, the more so that it entails very tight manufacturing tolerances.

The objective of the invention is to create a closure means of the kind defined in the preamble of claim 1 wherein inaccuracies of or damage to the front inner edge of the mouth of a bottle neck are not disadvantageous and where its sealing will not be degraded even in the presence of frequent pressure changes.

SUMMARY OF THE INVENTION

The basic concept of the disclosure of the invention is to implement the opening of the overpressure valve formed between the closure means and the neck of a bottle not by an axial displacement of the sealing projection along the sealing element, whereby the position and nature of the front inside edge of the mouth of a bottle neck assume predominant significance, instead by a radially inward displacement of the sealing projection. This radial displacement is implemented in that a cross-sectional slimming acting as a hinge is present in the bottom directly radially outside the cylindrical sealing element. Said slimming causes a peripheral zone of the closure component, as seen in the bottom's cross-section, to rotate about the hinge so formed when said bottom is made to bulge, whereas the outer region remains substantially unaffected. Because the cylindrical sealing part is solidly joined directly inside from the hinge to the bottom and because in this manner an elbow lever is formed between the bottom and the cylindrical sealing element, it follows that, upon bottom bulging, the sealing element pivots inward and as a result the sealing projection at its outer surface of said element is pressure-relieved and, upon sufficient pressure, will detach off the cylindrical inside surface of the bottle neck.

To ensure this radial pressure relief or this radial detachment under all circumstances, the radially sealing projection is so mounted in a special feature of the invention that for all bottom bulging caused by overpressure said projection shall be located in the region of the substantially cylindrical inside surface of the bottle neck.

The above discussion relates essentially to cross-sectional views, the cylindrical sealing element so viewed then actually forming a lever. In reality however a cylinder is involved, and therefore the cross-sectionally viewed lever effect in reality is a cross-sectional slimming of the cylindrical sealing element relative to the periphery. However pressure relief or detachment of the projection remain unaffected. Obviously the mechanical conditions also are affected by the length and rigidity of the cylindrical sealing element, however these are parameters which can be selected by a typical expert. The same consideration applies to the design of the hinge-forming cross-sectional slimming in the bottom of the cap-shaped closure means. The cross-sectional slimming must be pronounced enough in the axial direction to achieve the desired easy pivoting. On the other hand said slimming must be limited radially to avert undesired parallel motion in the axial direction.

In a development of the invention, the closure component comprises an axial stop located radially outside the cross-sectional slimming acting as a hinge to rest against an opposite mating stop at the bottle neck. Appropriately said stop is mounted in the radial region of the top end of a bottle neck forming the mating stop. Illustratively the stop may be formed merely by the conceptually extended bottom resting against the end surface of a bottle neck and thereby causing the closure means'bottom to be firmly positioned in the outer rim zone, thereby precluding axial motions of the hinge and hence axial motions of the sealing surface formed at the projection of the sealing element and hence also

friction between the sealing surface and the cylindrical inner surface of the bottle neck. In this manner abrasion of and damage to this sealing surface caused by bulge changes of the closure-means bottom due to pressure variations cannot arise.

The axial stop at the closure component obviously must be designed to allow the overpressure to escape through this stop. If the stop is annular, this escape may be assured using radial channels or passages. However the stop may be in the form of discrete stop elements distributed along the periphery of the sealing element and thereby forming passages between them. Moreover the stop may be designed to rest against a projection outside the bottle neck, said projection then forming the mating stop.

In a further embodiment of the invention, a rib is present between the sealing cap and the cylindrical closure means, said rib bracing the elbow lever formed by the bottom and the closure component. As a result the motion of the bottom caused by bulging due to increasing pressure in a closed bottle is more effectively transmitted to the cylindrical sealing element and hence pressure relief, or lifting of the projection, is improved, especially regarding the inside pressure acting radially outward on the sealing element.

In the simplest cases, the advantageous rib effect can be achieved with only one rib. Obviously several peripherally equidistant ribs also may be used.

In a further appropriate development of this embodiment, in the region where it merges into the sealing element, the rib runs as far as a zone radially remote from the sealing projection. In this manner an unbraced and hence elastic region remains axially between the rib and the projection.

In a further development of this embodiment, in the region where it merges into the bottom, the rib runs as far as a zone which is radially remote from the axis or center of the closure component. This feature opposes degradation of bottom bulging with increasing pressure and hence the action as an overpressure valve is improved.

Lastly, the cross-sectional slimming is radially configured in such manner in a further development of the invention that the hinge it forms lies on the conceptually extended inside surface of the neck of a bottle. On account of this position of the slimming and hence of the hinge, the radially sealing projection resting against the inner wall of a bottle neck will only be pressure relieved or detached transversely to the inside surface of the bottle neck when the bottom of the closure cap bulges. In this manner axial frictional motions between the sealing projection along the inside surface of the bottle neck are opposed and thus also wear and leakage.

BRIEF DESCRIPTION OF THE DRAWING

The drawing is a cross-sectional and partial cutaway view of a closure component made in accordance with the present invention.

The invention is elucidated by an illustrative embodiment and in relation to a drawing.

DETAILED DESCRIPTION OF THE INVENTION

The drawing is a cross-section and partial cutaway view of a closure component 1 designed as a screw cap and screwed onto a bottle neck 2 only shown at its front part. The closure component 1 comprises a bottom 3 from which a cylindrical sealing part 4 runs axially inside the neck 2, said sealing part 4 comprising at its outside a projection 5 resting against a cylindrical inside surface 6 of the neck 2. The outside diameter of the projection 5 is slightly larger than the diameter of the inside surface 6 in such manner that the projection 5 when in its screw-on condition as shown, rests at a specified force against the inside surface 6. Accordingly the projection 5 is precluded from making contact with a front, inside edge 7 of the mouth of the neck 2.

Directly radially outside the sealing element 4, the bottom 3 comprises a cross-sectional slimming 8 forming a hinge; an elbow lever formed by the sealing element 4 and that part of the bottom 3 running radially inward from the cross-sectional slimming 8 is pivotable about said hinge.

An external and cylindrical retaining element 12 of the closure means 1 comprises an inner thread 13 at its inside to engage an outside thread 14 of the bottle neck 2. Also a stop 10 is present inside at the retaining element 12 and makes contact with a mating stop 11 formed at the top end of the bottle neck 2. In this manner the stop 10 and the mating stop 11 constrain an accurate and in particular a fixed position of the hinge formed by the cross-sectional slimming.

A rib 15 is mounted in the region of the angle between the bottom 3 and the sealing element 4 and is rigidly affixed to said bottom 3 and sealing element 4 and is integral with them. The rib 15 is triangular and runs radially as far as a zone which is away from the sealing projection 5 but ends in a radial zone away from the axis 16. Because of this slight radial inward dimension, the bracing of the bottom 3 is kept small with respect to bulging.

In use, and after filling the bottle with the neck 2 being discussed, the cap-shaped closure means 1 is screwed onto the neck 2 until the stop 10 comes to rest against the mating stop 11. In this process, the projection 5 at the sealing element 4 glides onto the inside surface 6 of the neck 2 and thusly seals the bottle-inside. If overpressure is generated in the bottle, for instance in case the beverage is gas-pressure generating, the bottom 3 will bulge outward so that its rims rotate about the cross-sectional slimming 8 representing a hinge. As a result, the arm formed by the sealing element 4 pivots radially inward and thereby the force with which the projection 5 presses against the inside surface 6 of the neck 2 is reduced. At a predetermined overpressure and hence at a predetermined bulging of the bottom 3, the projection 5 detaches off the inside surface 6, allowing the overpressure to escape. Thereby the bulge of the bottom 3 decreases and the projection 5 again comes to rest tightly against the inside surface 6. The rib 15 improves the transmission of the deviation of the bottom 3 caused by overpressure-bulging to the sealing element 4 and the elbow lever formed by the bottom 3 and the sealing element 4 is braced thereby. As a consequence the overall overpressure valve operates more sensitively and accurately to overpressure. In particular a specified blowoff pressure is more easily observed even at varying manufacturing tolerances.

Because the position of the hinge formed by the cross-sectional slimming 8 is made practically invariant by the stop 10 and the mating stop 11, axial displacements of the sealing element 4 are practically precluded and also relative motions between the projection 5 at the sealing element 4 and the inside surface 6 of the neck 2. Therefore the sealing effect remains unaffected even when frequent changes in pressure cause changes in the bulging of the bottom 3. Such changes merely entail changes in resting pressure by the projection 5 that however do not degrade sealing.

I claim:

1. A closure means for a bottle, comprising:

a) a cap-shaped closure component;

b) a projection directed inwardly from an edge of said cap-shaped closure component adapted to engage an outwardly directed projection at a neck of a bottle;

c) a substantially cylindrical sealing element extending axially from a bottom of said closure component, said sealing element being disposed within said closure component;

d) a radial projection extending from a radially outwardly facing surface of said sealing element and disposed away from said bottom and having a diameter larger than the inside diameter of the neck of the bottle to be sealed by said closure means in such a way that a sealing surface formed by said radial projection tightly rests against an inside surface of the neck in a closed mode;

e) said bottom comprises a cross-sectional slimming disposed radially beyond said cylindrical sealing element, said slimming has a thickness less than the thickness of an adjacent portion of said bottom such that said slimming functions as a hinge;

f) said bottom and said sealing element form an elbow lever pivotable about said hinge; and

g) at least one rib disposed in a space formed between said bottom and said sealing element to brace said sealing element against movement relative to said bottom, such that upon bulging of said bottom said radial projection is substantially radially detached from the inside surface of the neck by a lever action of said elbow lever pivotable about said hinge.

2. Closure means as in claim 1, wherein said sealing element comprises an axial stop radially disposed beyond said cross-sectional slimming to rest against an opposite mating stop at the neck.

3. Closure means as in claim 2, wherein said axial stop is adapted positioned in a radial region of a top end of the neck forming said mating stop.

4. Closure means as in claim 1, wherein said at least one rib runs axially along said sealing element as far as into a zone away from said radial projection in a region merging into said sealing element.

5. Closure means as in claim 4, wherein in said region said rib terminates radially away from an axis of said closure component.

6. Closure means as in claim 1, wherein said rib is triangular.

7. Closure means as in claim 1, wherein said cross-sectional slimming is disposed radically inwardly of a radially outermost surface of the radial projection.

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United States Patent [19]

Perne et al.

[11] **Patent Number: 4,699,285**

[45] **Date of Patent: Oct. 13, 1987**

[54] **CLOSURE DEVICE FOR BOTTLES COMPRISING A SCREWABLE CAP**

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[52] **U.S. Cl.** **215/252**; 215/31; 215/329; 215/344

[58] **Field of Search** 215/329, 344, 354, 230, 215/252

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Primary Examiner—Donald F. Norton

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[57] **ABSTRACT**

A closure device for bottles comprising a cap with a pilfer or tamper proof strip, and with thread conical screwing means on the neck of the bottle and on the cap. The screwing means comprises insert means adapted to cooperate with a cylindrical part of the neck bottle and a lip outside the insert and designed to provide a longitudinal positioning stop.

20 Claims, 8 Drawing Figures

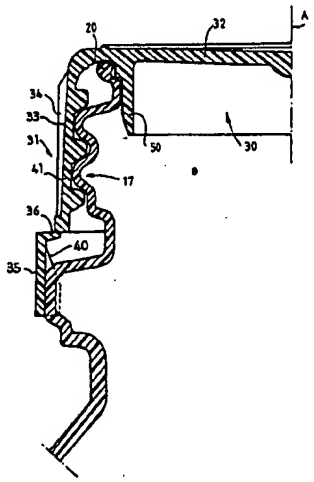


FIG. 3a

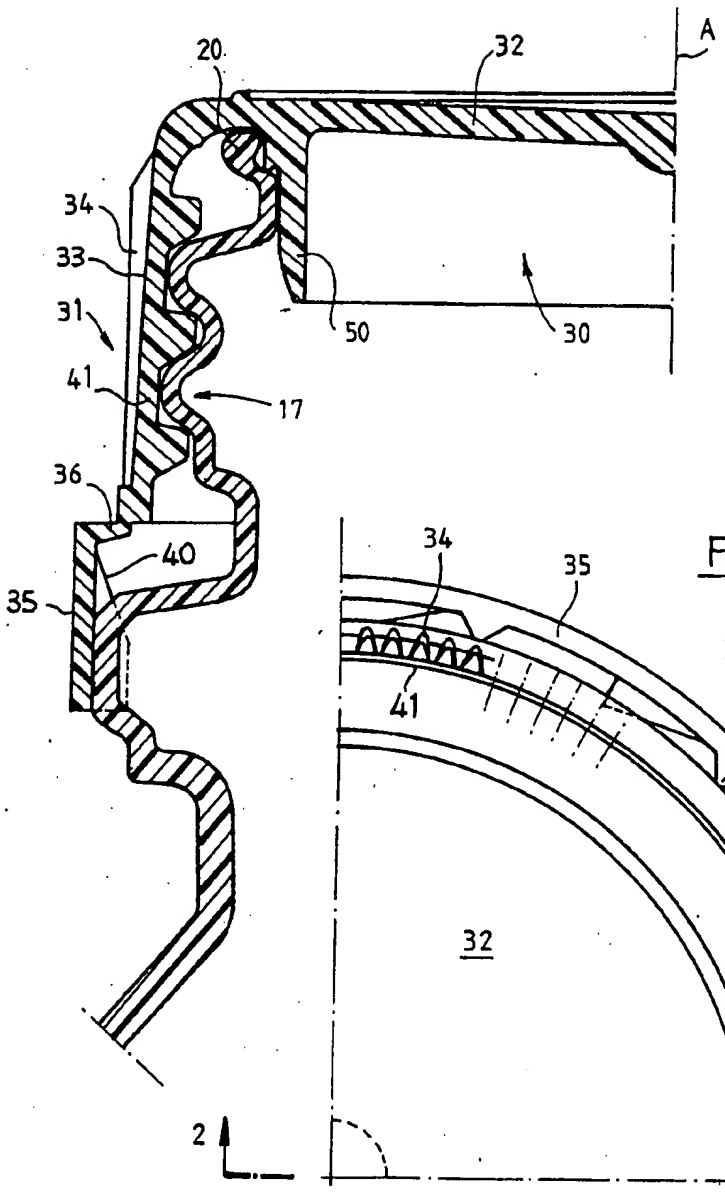


FIG. 1

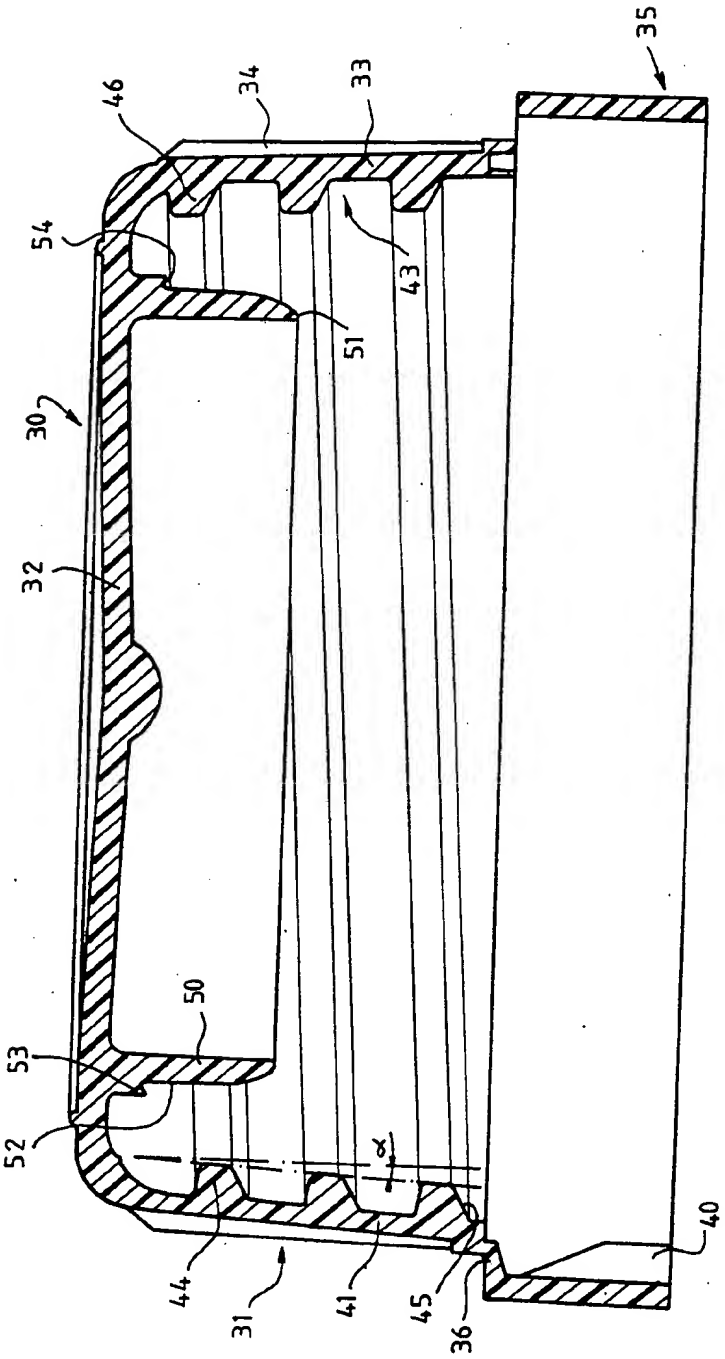


FIG. 2

FIG. 3

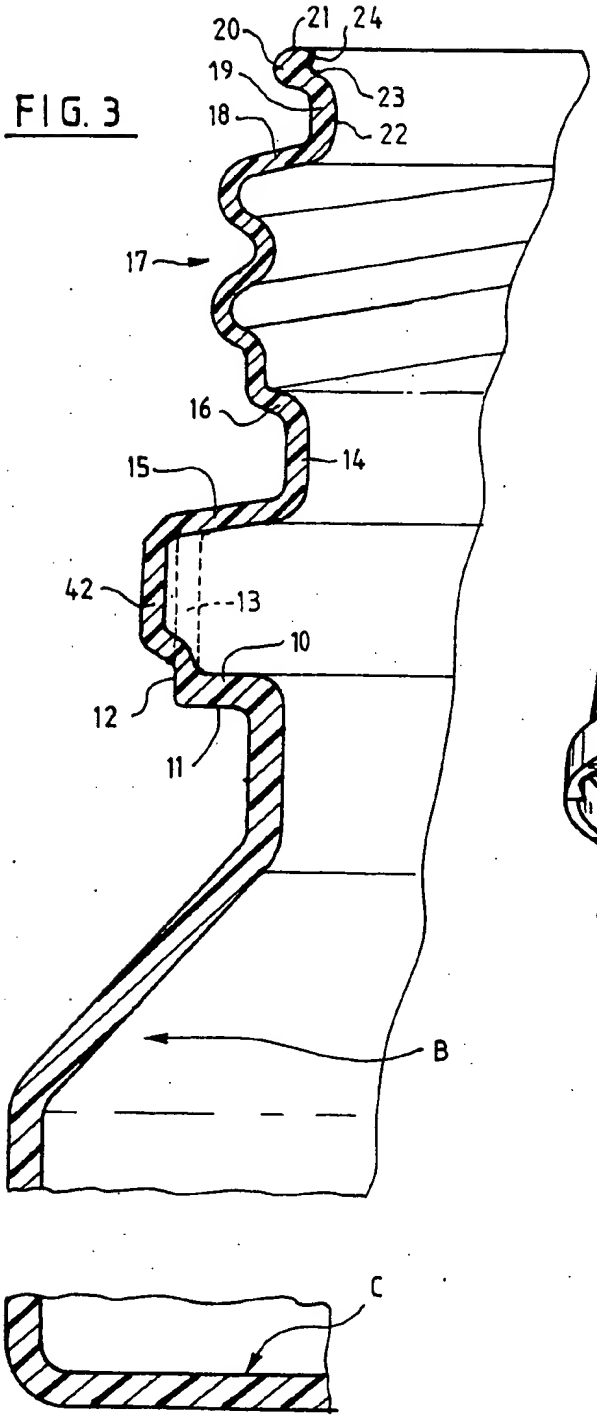


FIG. 7

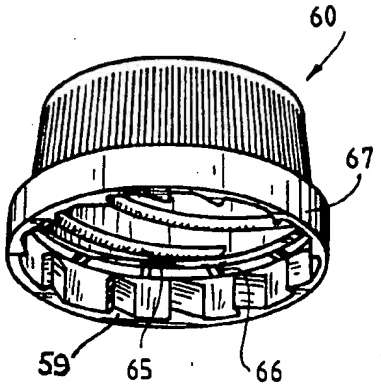


FIG. 6

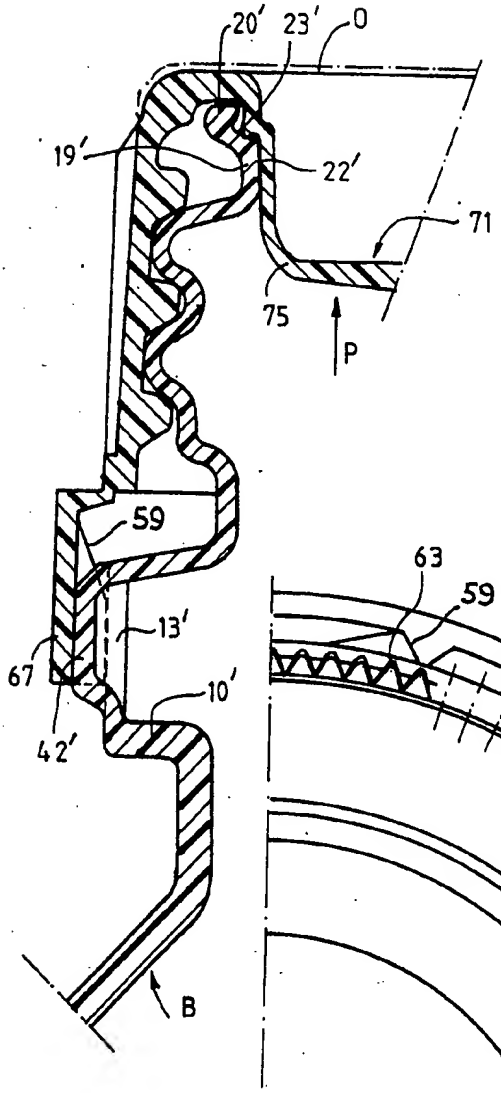
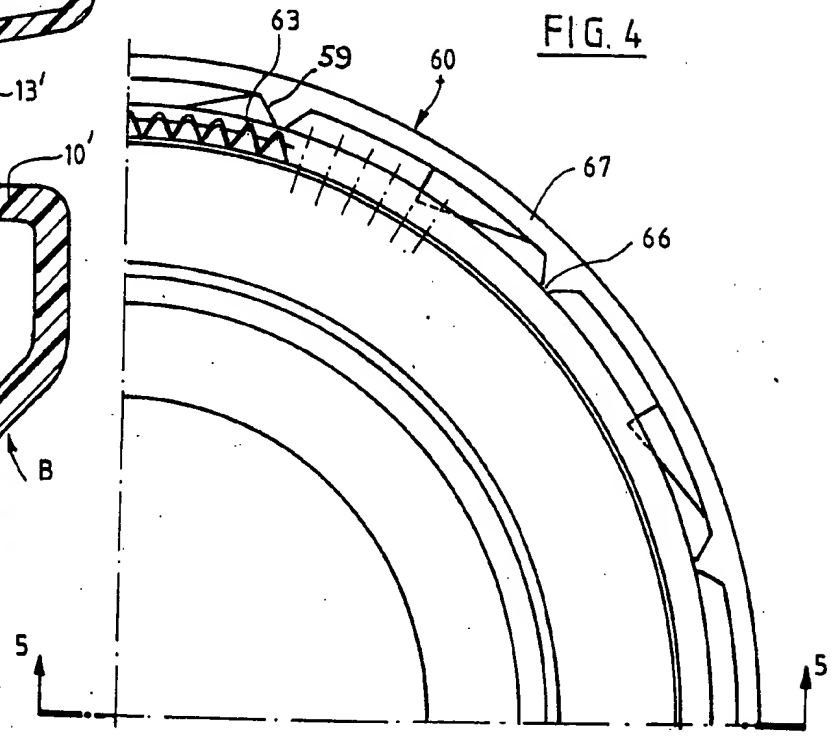


FIG. 4



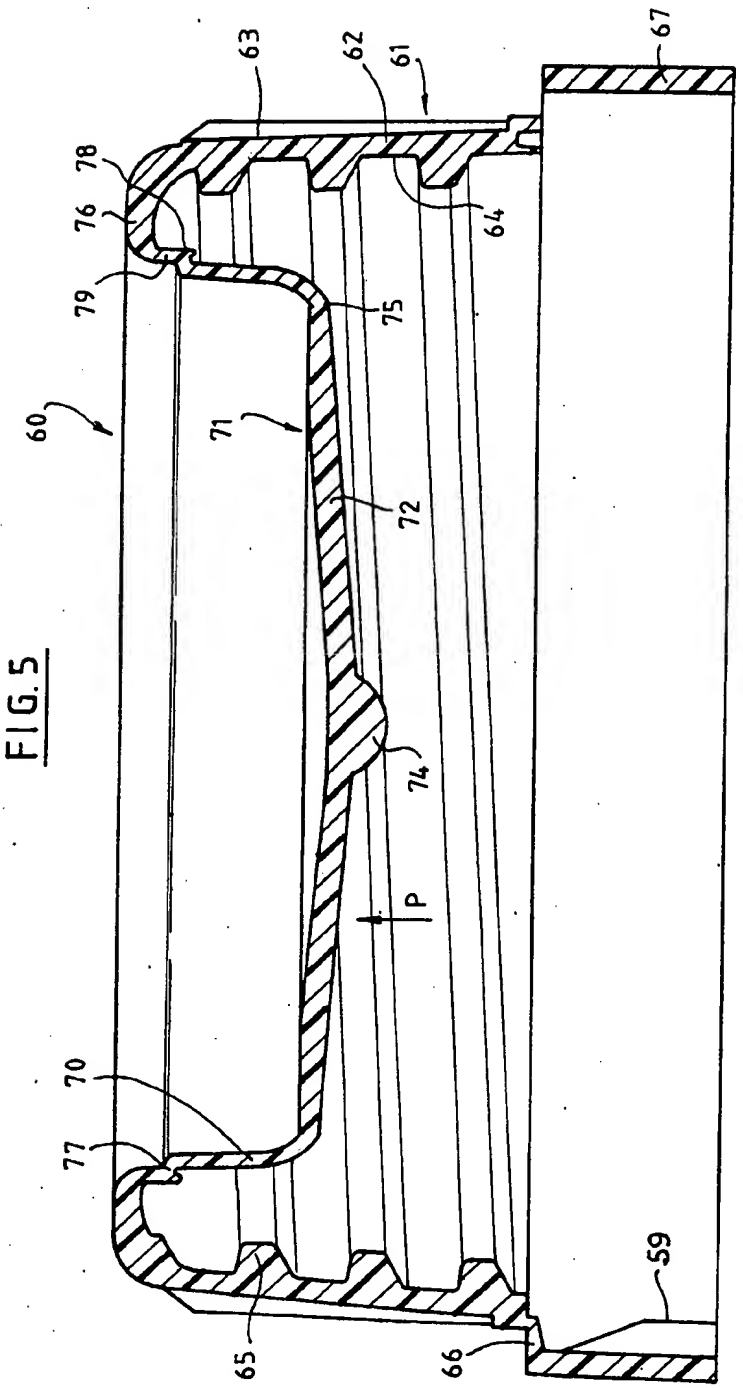


FIG.5

CLOSURE DEVICE FOR BOTTLES COMPRISING A SCREWABLE CAP

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to a closure device for bottles comprising a screwable cap.

It relates more particularly to such a device comprising a plastic material cap with a pilfer or tamper proof strip integral with said cap as long as the bottle has not been opened a first time.

2. Description of the Prior Art

Numerous devices of this type are already known which find applications more particularly for closing bottles containing drinks such as aerated or mineral waters.

The simple constructions of known devices, in which a cylindrical thread of the cap cooperates with a mating thread on the neck of the bottle are not always satisfactory in so far as their sealing is concerned, whereas more complex constructions are difficult and expensive to manufacture. In known devices, the sealing depends not only on the relative hardness of the materials forming the bottle and the cap, but also on the degree of mechanical accuracy of the parts which cooperate together, as well as on the more or less good quality of screwing during the bottling operation.

Now, because of their methods of manufacture, plastic material bottles obtained by extrusion/blowing of PVC frequently have imperfections of shape as regards their neck and as regards their neck end face, which is not always rigorously flat due to the cut of the plastics tube resorted to to manufacture the bottle. Moreover, and for bottles of this type with a rectangular cross section, different elongations of the neck and of the non cylindrical part adjacent thereto sometimes give rise to deformations of the neck and to oval shaped parts therein, which result in unsatisfactory stoppering of the bottles particularly when modern bottling machines are used whose capacity is of the order of 30,000 bottles per hour. The consequences then are deterioration of the contents of the bottle or else, for bottles containing fizzy drinks, risks of seeing the cap expelled during bottling or during transport and storage at a selling point.

In order to solve this problem, attempts have been made using insert type caps with conical thread means adapted to cooperate with matching thread means of the bottle.

Such a cap is shown, for instance, in DE-A-2 323 561. In the cap there described, however, sealing is obtained through cooperation of an edge of the container with a groove of the cap. Accordingly, such a device cannot be used for bottles which might show slight differences in shape, such as PVC extrusion/blown bottles. In addition, the cap described in the prior art publication has an angle of about 30° so that the cap is thick and thus costly.

OBJECTS OF THE INVENTION

Consequently an object of the invention is to provide an improved closure device for bottles comprising a screwable cap which in all cases provides an excellent quality of sealing and thus overcomes the drawbacks mentioned above of known devices.

Another object of the invention is to provide such a device particularly well adapted to stoppering bottles made from a plastic material, more particularly from PVC, and which, having a rectangular cross section, are manufactured by extrusion/blowing, either in the usual way or by bioorientation.

A further object of the invention is to provide a device whose cost is comparable to that of known screw or snap fit devices and which is simple to use in the bottling factory, more particularly in such factories with a high hourly output rate.

Finally, an object of the invention is to provide a device of the above-mentioned type which overcomes the constraints related to the different kinds of materials forming the bottle and cap while providing in all circumstances an excellent seal.

SUMMARY OF THE INVENTION

These objects are attained by a device in accordance with the invention which comprises a cap with an insert molded as a single piece from a plastic material. The cap is adapted to be fitted to a bottle by screwing using conical thread means. The insert provides a surface sealing means by cooperation of the external face of its side wall with the internal surface of a substantially cylindrical collar at the free end of the neck of the bottle. A lip is adapted to cooperate with a substantially truncated cone shaped bearing zone formed at the free end of the collar at the end of screwing of the cap on the bottle. The bearing zone is provided adjacent the insert and outside thereof.

The taper of the thread means is between 2° and 10° and is advantageously on the order of 3°.

In one embodiment, the insert is a cylindrical skirt with an external surface of a diameter slightly greater than that of the internal surface of the collar in the unclosed position of the device. The lip, is of annular shape and of a diameter slightly greater than that of the external surface of the skirt. The lip is provided at the junction of the skirt and the bottom of the cap.

In another embodiment, the insert is a cup with truncated cone shaped side wall in the unclosed position of the device and with a bottom having a taper directed outwardly of the cap and an extra thick portion at its center. The cup is connected to an annular bottom zone of the cap by a fold having a greater resilient deformability than the rest of the cap and in the vicinity of which the lip is formed.

According to another feature, the abutment lip is formed by the end of a short cylindrical sleeve adjacent the fold with greater resilient deformability and connecting the latter to the annular bottom zone of the cap.

The device of the invention comprises a pilfer or tamper proof strip which has catches spaced evenly apart over the internal periphery of the strip. The catches are adapted to cooperate with antireturn notches of conjugate shape formed at regular intervals over the periphery of the external face of the neck of the bottle when the cap is completely screwed thereon.

The invention also contemplates providing a bottle adapted to be part of a stoppering device such as above defined. The bottle is obtained by forming a plastic material and has a conical thread in its neck part. The forming is an operation of extrusion/blowing of PVC during which the bottle is formed in the vicinity of its free end with a collar having a substantially cylindrical internal surface. The collar is continued in the direction of the free end by a substantially truncated cone shaped part.

To match the bottle, the invention provides a cap comprising a conical thread on the internal face of its side wall and an insert adapted to penetrate into the neck of the bottle which the cap is intended to equip. The cap is molded from a high density polyethylene. The insert is a skirt or a cup connected to a bottom. A circular abutment lip is formed on the external face of the side wall of the insert in the vicinity of the junction between the insert and the bottom.

The conical thread of the cap is an artillery type thread with a taper angle of about 2° to 10°, advantageously on the order of 3°.

In one embodiment, the insert is shaped as a cup having a concave bottom with a slight extra thickness at its center and a side wall connected to an annular bottom zone. A zone or fold of greater resilient deformability than the rest of the cap connects the cup to a cylindrical part connecting to the bottom annular zone, the circular abutment lip forming the end of the cylindrical part.

The cap comprises a pilfer or tamper proof strip and is advantageously provided with a metal sealing foil thermowelded or thermobonded to the zone and adjacent thereto.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is is a partial top view of a stoppering device in accordance with the invention, in a first embodiment;

FIG. 2 is a sectional view along line 2—2 of FIG. 1;

FIG. 3 is a partial longitudinal sectional view of a bottle in accordance with the invention;

FIG. 3*a* is a partial view in longitudinal section of a bottle comprising a device in accordance with the invention with a cap of the type shown in FIGS. 1 and 2;

FIG. 4 is a view similar to FIG. 1 but for another embodiment;

FIG. 5 is a sectional view through line 5—5 of FIG. 4;

FIG. 6 is a partial view in longitudinal section of a bottle equipped with a device comprising a cap according to FIGS. 4 and 5; and

FIG. 7 is a perspective view of the cap shown in FIGS. 4 and 5.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

References will first be made to FIGS. 1 to 3*a*. In the embodiment illustrated in these Figures, the device of the invention is provided for use with a bottle made from a plastic material, for example from PVC. The bottle advantageously is obtained by extrusion/blowing and has a circular cross section. Bottle B is shaped, in its part opposite the bottom C, along a collar 10 which allows—by an annular zone 11 substantially perpendicular to the axis A of the bottle and a substantially cylindrical zone 12. The holding and centering of the bottle by means of a star, not shown, during the bottling operation.

The substantially cylindrical zone 12 is continued towards the end of the neck of the bottle by a first cylindrical part 13 connected, by a part 15 in the form of a truncated cone, to a second cylindrical part 14 of smaller diameter and of smaller height than the first cylindrical part 13.

To the second cylindrical part 14 is connected a shoulder 16 from which is formed on the neck a conical thread 17. Beyond the threaded part, the neck has a truncated cone shaped part 18 of substantially the same slope as the part 15. The truncated cone shaped part 18 is followed by a cylindrical collar 19 ending in a flange 20. The flange 20 is limited by a substantially flat surface 21. The substantially flat surface 21 may, however, have slight irregularities due to the method of manufacture of the bottles, which normally includes a cut of the plastic tube from which the bottle originates by extrusion/-blowing. The substantially flat surface 21 is connected to an internal surface 22, which bulges slightly towards the inside of the cylindrical bottle, of collar 19 through a truncated cone shaped part 23 and a rounded part 24, the longitudinal section being thus somewhat in the form of an S.

A plastic material cap 30, FIGS. 1 and 2, is adapted to cooperate by screwing with the neck of the bottle B. The cap 30 is advantageously made from high density polyethylene—i.e., of a plastic having a hardness less than that of the material forming the bottle B.

The cap 30 is shaped as a cup 31 with a bottom 32 and a tapering side wall 33 which, on its external face, has ribs 34 intended to facilitate gripping of the cap 30 for opening and/or closing the bottle to which it is fitted. A pilfer or tamper proof strip 35, forming an integral part of the cap 30 prior to closure of the bottle and as long as the bottle has not been opened for a first time, is connected to the side wall 33 of the cap 30 by bridge means 36 evenly spaced apart from the angular point of view. The bridge means 36 are adapted to be broken when the bottle is opened for the first time.

On the internal face of the strip 35 are provided extra thick portions 40 at regular angular intervals. The extra thick portions 40 are somewhat similar to pawls or catches. They have a triangular cross section over a part of their height, and they are adapted to cooperate with antireturn notches 42 of a mating shape 42, FIG. 3*a*, formed at regular intervals on the first cylindrical part 13 of the bottle B.

The cap 30 comprises on the inner face 41 of its tapering side wall 33 a conical thread 44 whose starting point 45 is in the vicinity of the connecting zone of the cap proper (i.e., the cup 31) with the strip 35 and whose end 46 is situated in the vicinity of the bottom 32 of the cup 31.

The conical thread 44 has a taper of between 2° and 10°and, is advantageously of the artillery type, which provides good locking.

In one embodiment having given good results, the conical thread 44 has a screw of a turn and a half with a taper of 3°, as shown by angle α in FIG. 2.

The value chosen for the cap taper enables the cap to have a cylindrical outer surface while keeping a small wall thickness, so that both the quantity of plastic material used and the price are small.

According to the invention, the cap 30 further comprises a cylindrical skirt 50 directed towards the inside of the cup 31 from the bottom 32. The height of the cylindrical skirt 50 is on the order of half that of the cup 31, and the diameter of the cylindrical skirt 50 on its external surface 52 is slightly greater than that of the internal surface 22 of the bottle B. The cylindrical skirt 50 penetrates with the bottle B first of all by its thinned end 51.

According to another feature of the invention, an annular lip 53 is provided at the connection of the cylindrical skirt 50 with the bottom 32 of the cup 31. The annular lip 53 has a diameter slightly greater than that of the external surface 52 and is connected to the external surface 52 by a rounded portion 54.

For using a device of the invention, the cap 30 is fed to a screwing head, the bottle B being held motionless by cooperation between a star and the collar 10 so as to exert no vertical force on the bottle. Surface sealing is provided from the very beginning of the screwing operation, when the cylindrical skirt 50 is fitted into the cylindrical collar 19 with a slight resilient deformation of the latter. Cooperation of the annular lip 53 with the truncated cone shaped part 23 of the flange 20 forms a longitudinal positioning stop. At the end of screwing, the extra thick portions 40 of the pilfer or tamper proof strip 35 cooperate with the antireturn notches 42 on the neck of the bottle B, on which they are positioned during screwing by slight resilient deformation of the strip 35.

Sealing provided by the stoppering is excellent, although the two materials used are of comparable hardness. Moreover, the pilfer proofness is perfect, since the cap 30 cannot be unscrewed without breaking the bridge means 36 connecting the tamper proof strip 35 to the rest of the cap.

The conical thread of the device of the invention provides perfect fitting of the cap 30 on the neck despite the possible existence of imperfections of the shape of the neck of the bottle or an unsatisfactory positioning of the bottle with respect to the screwing head. Furthermore, the torque applied by the screwing head is used entirely for the screwing, without having to overcome friction forces, as was frequently the case in prior art cylindrical thread devices.

Closure is thus provided more readily and easily, at the end of screwing, and with a constant clamping force.

Reference will now be made to FIGS. 4 to 7, showing another embodiment. In this embodiment the body of the bottle B, also made from PVC and obtained by extrusionl blowing, has a rectangular cross section. However, the structure of the neck of the bottle B is identical to that of the above described embodiment. Accordingly, corresponding parts bear, in the following description, the same references as those used above, but the index "'" has been added to the part number in each case.

Thus, the bottle B comprises, above the collar 10', a first cylindrical part 13' on which are formed antireturn notches 42' intended to cooperate with the catches 59 of a pilfer or tamper proof strip 67 of a cap 60. The cap 60 is, advantageously molded from high density polyethylene. It is shaped as a cup 61 with side walls 62 of a truncated cone shape and having an external ribbed surface, as shown at 63. Similarly to what was described above, the cap 60 is provided, on the internal face 64 of its side wall 62, with a conical thread 65 which starts in the vicinity of the connecting zone between the cap proper (i.e., the cap 61) and the pilfer proof strip 67, identical to that described above and connected to the body of the cap by breakable bridge means 66.

The conical thread 65 is similar to that of the above described embodiment i.e., it is made with a screw of a turn and a half, of the artillery type, and with a taper angle of about 2° to 10°, advantageously 3°.

In this embodiment, however, the sealing element, instead of being formed by a cylindrical skirt, is formed by a cup 71, with a bottom 72, and with a truncated cone shaped side wall 70.

The cup 71 has a taper opposite that of the side wall 62. That is to say, the apex of the cone defining the truncated cone shaped side wall 70 is situated inside the cap 60 and/or the bottle B when the cap 60 is in position, whereas the apex of the cone defining the side wall 62 of the cup 60 is outside the bottle B.

As can be seen in FIG. 5, the bottom 72 of the cup 61—with a slight conical shape turned outwardly of the cap 60 and with a small extra thick portion 74 at its center—is connected to the truncated cone shaped side wall 70 by a rounded zone 75. In accordance with the invention, the truncated cone shaped side wall 70 is connected to an annular bottom zone 76 of the cap 60 by a zone or bend 77. The bend 77 is relatively flexible and is more easily deformable than the rest of the cup 71 in order to facilitate fitting of the truncated cone shaped side wall 70 of the cup 71, forming the sealing zone, into the internal surface 22' of the cylindrical collar 19' of the bottle B.

The cap 60 also has, in the neighbourhood of the bend 77, a cylindrical lip 78 of small height having a diameter slightly bigger than that of the truncated cone shaped side wall 70. The cylindrical lip 78 forms the end of a short cylindrical sleeve 79 connected to the annular bottom zone 76 and outside the cup 71, to which the annular bottom zone 76 is connected by the bend 77.

The use of this embodiment is similar to that of the preceding embodiment.

During screwing of the cap on the bottle B, the cup 71, whose depth is approximately half the height of the cap properly speaking, penetrates into the neck of the bottle B and provides a surface sealing by contact of the external surface of the truncated cone shaped side wall 70 with the internal surface 22' of the collar 19'. Abutment of the cylindrical lip 78 against the truncated cone shaped part 23' of the flange 20' of the bottle provides longitudinal positioning.

In this embodiment, and as indicated above for the embodiment shown in FIGS. 1 to 3, the use of a conical thread overcomes a possible lack of concentricity of the parts constituting the device and allows good penetration of the cup 71 into the bottle B, without any wedging effect likely to cause jamming or tears or likely to damage the bottle.

This good result is obtained—particularly in so far as the sealing of bottles with a rectangular cross section is concerned (i.e., whose body is connected to the neck by flat portions and which were therefore considered as more difficult to stopper)—, because of the resiliently deformable bend 77 and the cylindrical lip 78.

Furthermore, the fact of using the torque of the screwing machine only for screwing and at the end of the screwing path allows the cap 60 to shape the neck of the bottle with constant clamping force. Closure is thus provided reliably and rapidly whatever the running conditions, particularly during the warmer summer season, which is an important factor for machines with high output rate, of the type used at the present time in bottling factories.

An embodiment such as is described above is particularly well adapted to the closure of bottles which are to be stacked. In this case, in fact, the internal pressure of the bottle increases, particularly that at the bottom of the pile. The relatively thicker bottom 72 of the cup 61 is then deformed by a thrust in the direction P (see FIG. 6), which tends to make the bottom horizontal, with consequently a more intense lateral reaction, in line with the sealing zone (i.e., in contact with the external face of the truncated cone shaped side wall 70 and of the internal surface 22' of the bottle B).

In a modification, shown schematically in FIG. 6, a metal sealing foil, most simply made from an aluminium film, is added to the cap 60 and is thermowelded or thermobonded to the annular bottom zone 76 of the cap and to part of the periphery thereof.

The sealing foil, shown at 0, may advantageously carry advertizing matter.

Furthermore, the sealing foil 0 contributes to the good conservation of the contents of the bottle by forming a gas impervious barrier and also, if such be the case, avoids the introduction into cup 71 of humidity and/or undesirable products such as fragments of packings or similar.

Although the invention has been described with reference to embodiments of the cap comprising a pilfer or tamper proof strip, it finds applications for embodiments similar to those described above, but without the strip. More particularly, the invention finds application in all cases where it is desired to obtain stoppering with good sealing for plastic material bottles, in particular bottles obtained by extrusion/blowing of PVC.

What is claimed is:

1. A bottle cap molded from a plastic material piece shaped with a bottom and a side wall symmetrical about a longitudinal axis and joined to said bottom, a conical thread on the internal face of said side wall for holding said bottle cap on the neck of a bottle during screwing of said conical thread on the bottle, a skirt spaced apart from said side wall and coaxial with said side wall and of a smaller length than said side wall as measured parallel to said axis, said skirt extending from said bottom inwardly of said side wall and being adapted for cooperating by surface contact with the inside of the neck of the bottle during said screwing, and a lip immediately adjacent the external surface of said skirt and adjacent to but spaced from said bottom, said lip being adapted to make abutting contact during use with a truncated cone shaped part in the neck of a bottle into which said bottle cap is inserted, said lip having an external diameter slightly greater than the external diameter of said skirt but slightly less than the internal diameter of the neck of the bottle in which it penetrates at the end of said screwing so as to form a stop in the longitudinal direction of said axis.

2. The bottle cap as claimed in claim 1, wherein the angle of said conical thread is between 2° and 10°.

3. The bottle cap as claimed in claim 2, wherein said angle is of the order of 3°.

4. The bottle cap as claimed in claim 1, wherein said skirt has a first end and a second end, the end of said skirt nearest to said bottom is connected thereto by a zone with greater elastic deformability than the rest of said bottle cap, and the other end of said skirt is closed by a wall, said wall having an extra thick portion in the vicinity of its central part and being shaped with a conical surface having its conicity in the opposite direction to that of said conical thread.

5. The bottle cap as claimed in claim 1 further including, at the end of said side wall the furthest away from said bottom, a thief proof ring, bridges connecting said thief proof ring and said side wall together, teeth on the internal face of said ring adapted to cooperate during use with teeth on the external surface of the neck of the bottle, said teeth on the ring and the teeth on the bottle being engaged when said bottle cap is immobilized longitudinally on the bottle at the end of screwing said bottle cap on the bottle.

6. The bottle cap as claimed in claim 5, wherein said bottle cap is made from high density polyethylene.

7. The bottle cap as claimed in claim 5, wherein said bottom is annular in shape and further includes on the outside of said bottle cap a cover made from a metal film thermofixed on the periphery of said annular bottom.

8. A cap for a bottle, said cap:

(a) being molded from a plastic material;

(b) having a bottom end and an at least substantially cylindrical side wall, each of which has an external surface and an internal surface, the internal surface of said at least substantially cylindrical side wall being tapered conically outwardly away from said bottom;

(c) having a conical thread on the internal surface of said at least substantially cylindrical side wall;

(d) having an at least generally cylindrical skirt extending at least generally perpendicularly from the internal surface of said bottom coaxially of said at least generally cylindrical side wall, said at least generally cylindrical skirt having an external surface, an internal surface, and a shorter length than said at least generally cylindrical side wall and being sized, shaped, and positioned to make surface contact with and to slide axially relative to the inside of the neck of the bottle while said cap is being screwed on or off the bottle; and

(e) having an annular lip on the external surface of said at least generally cylindrical skirt adjacent to but spaced from the internal surface of said bottom, said annular lip being sized, shaped, and positioned to make axial abutting contact with a corresponding lip in the neck of the bottle when said cap is screwed onto the neck of the bottle to the maximum extent.

9. A cap as recited in claim 8 wherein the cone angle of said conical thread is between 2° and 10°.

10. A cap as recited in claim 9 wherein the cone angle of said conical thread is on the order of 3°.

11. A cap as recited in claim 8 wherein said at least generally cylindrical skirt has an annular zone of greater elastic deformability adjacent said annular lip on the side thereof away from said bottom.

12. A cap as recited in claim 11 and further comprising an at least generally planar surface connecting the end of said at least generally cylindrical skirt remote from said bottom.

13. A cap as recited in claim 12 wherein said at least generally planar surface is slightly bowed away from said bottom.

14. A cap as recited in claim 11 wherein the external surface of said at least generally cylindrical skirt is slightly conical and has a cone angle opening toward said bottom.

15. A cap for a bottle, said cap:

(a) being molded from a plastic material;

(b) having an annular first bottom and an at least substantially cylindrical side wall, each of which has an internal surface and an external surface, the internal surface of said at least substantially cylindrical side wall being tapered conically outwardly from said annular first bottom;

(c) having a conical thread on the internal surface of said at least substantially cylindrical side wall;

(d) having an at least generally cylindrical skirt extending at least generally perpendicularly from the inner edge of the internal surface of said annular

first bottom coaxially of said at least generally cylindrical side wall, said at least generally cylindrical skirt having an external surface, an internal surface, and a shorter length than said at least generally cylindrical side wall and being sized, shaped, and positioned to make surface contact with and to slide axially relative to the inside of the neck of the bottle when said cap is being screwed on or off the bottle;

(e) having an annular lip on the external surface of said at least generally cylindrical skirt adjacent to but spaced from the internal surface of said annular first bottom, said annular lip being sized, shaped, and positioned to make axial abutting contact with a corresponding annular lip in the neck of the bottle when said cap is screwed on to the neck of the bottle to the maximum extent; and

(f) having a second bottom connecting the end of said at least generally cylindrical skirt remote from said annular first bottom.

16. A cap as recited in claim 15 wherein the cone angle of said conical thread is between 2° and 10°.

17. A cap as recited in claim 16 wherein the cone angle of said conical thread is on the order of 3°.

18. A cap as recited in claim 15 wherein said at least generally cylindrical skirt has an annular zone of greater elastic deformability adjacent said annular lip.

19. A cap as recited in claim 15 wherein the external surface of said at least generally cylindrical skirt is slightly conical and has a cone angle opening towards said bottom.

20. A cap as recited in claim 15 wherein said second bottom is slightly bowed away from said annular first bottom.

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Bergholtz

(10) **Patent No.: US 6,260,723 B1**
(45) **Date of Patent: Jul. 17, 2001**

(54) **PACKAGE FOR FLOWABLE MEDIA HAVING A SNAP LID AND PREFORM FOR MAKING SAME**

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(73) Assignee: **Tetra-Laval Holdings & Finance**

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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§ 371 Date: **Jun. 23, 1999**

§ 102(e) Date: **Jun. 23, 1999**

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(58) **Field of Search** ..... 220/675, 780, 220/789, FOR 100, FOR 101, 659; 215/344, 343, 354, 321, 320, 43, 250, 317, 341, 256; 222/153.06, 562, 570

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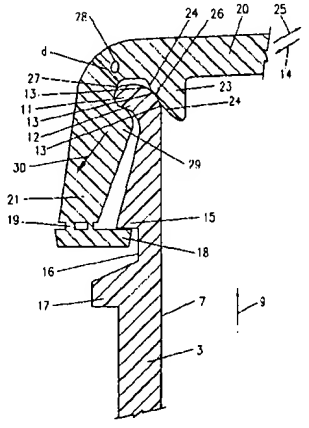
(57) **ABSTRACT**

A package for flowable media and a snap lid which package and snap lid are both made from thermoplastic material, in which a collar-shaped head of the package surrounds a pouring aperture of the package, which collar-shaped head has a retaining ring on its outside, an inside annular surface, and an upper end having an edge with a snap catch, which upper end can be closed using the snap lid. The snap lid has a closing wall from which an annular sealing lip projects towards an inside of the package, and can be brought into contact with an inside surface of the edge in sealing engagement. The closing wall is provided with an outside catch for snap engagement with a snap catch of the edge of the head. The head of the package widens outwards and upwards at its edge, and both the inner surface of this edge and an outer surface of the sealing lip on the snap lid are curved convexly relative to each other. The invention also includes preforms for making the package of the invention.

6 Claims, 3 Drawing Sheets



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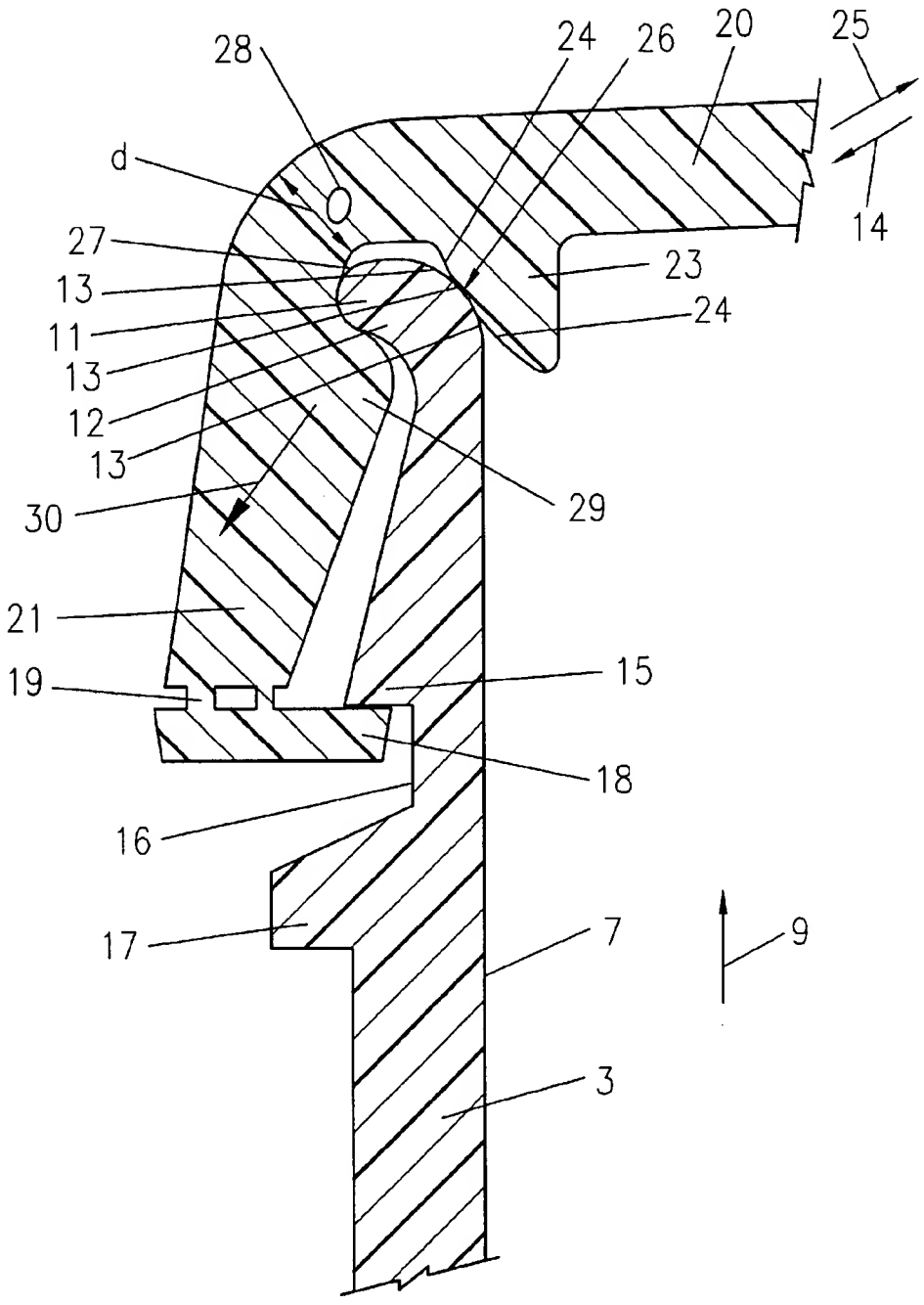

FIG 1

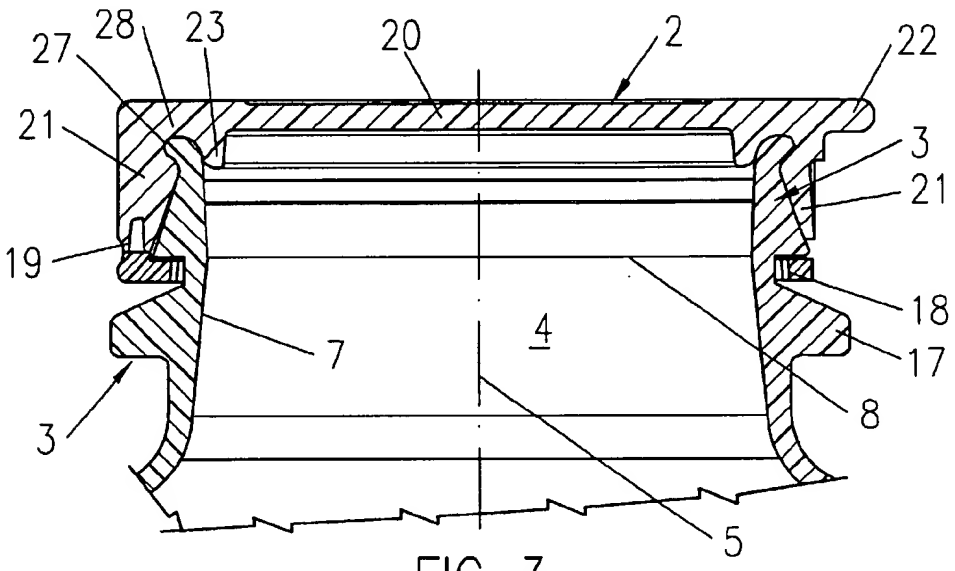

FIG 3

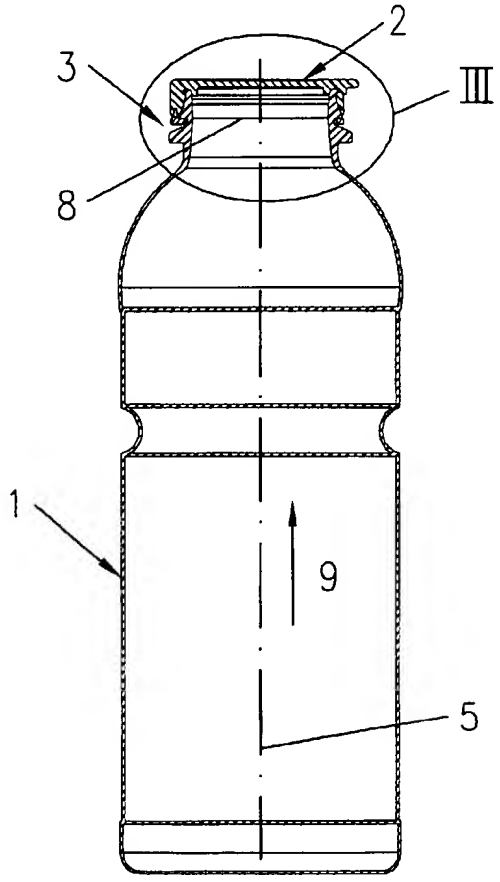

FIG 2

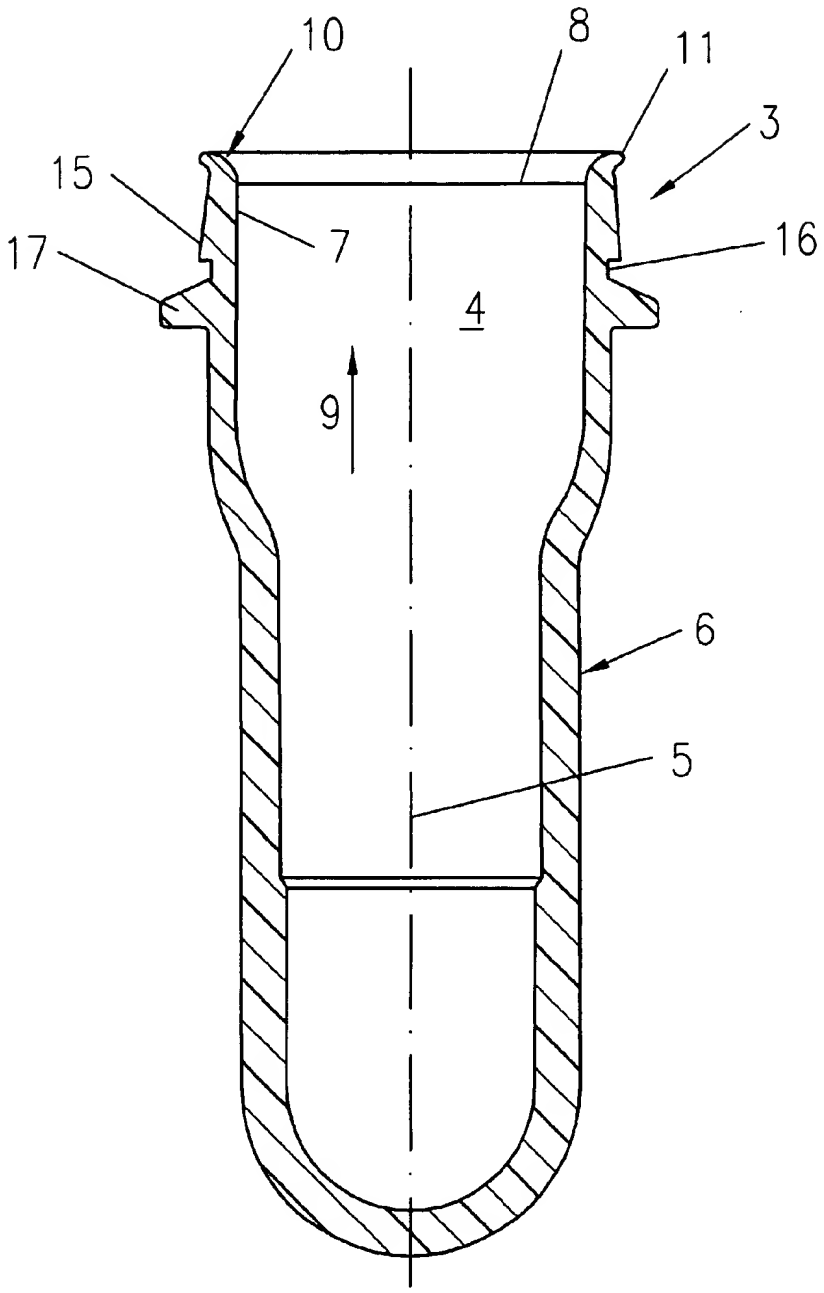

FIG 4

PACKAGE FOR FLOWABLE MEDIA HAVING A SNAP LID AND PREFORM FOR MAKING SAME

The invention relates to a package for flowable media with a snap lid, both of which are made from thermoplastic material, in which the collar-shaped head surrounds a pouring aperture, which has on the outside a retaining ring, on the inside an approximately annular internal surface, at the top at the free end an edge with a snap catch and which can be closed by means of the snap lid, from the inside of the closing wall of which an annular sealing lip projects towards the inside of the package, and can be brought into contact with the inside surface of the edge in a sealing engagement, and which has an outside catch for snap engagement with the edge of the head.

The invention also relates to an injection moulded blank for manufacturing a package for flowable media from thermoplastic material, in which the collar-shaped head surrounds a pouring aperture, and has on the outside a retaining ring, on the inside an approximately annular internal surface, and at the top at the free end an edge with a snap catch.

Injection moulded blanks made from plastics, in particular from polyethylene terephthalate (PET) are known. With blanks, and the packages formed from them, for example, bottles, a distinction is made between three different areas, namely the bottle head, the body and the base. The bottle head is also often moulded with a thread and with sealing surfaces. The bottle later inflated and filled is then closed with a screw lid. For aseptic closures, the screw lid either has on it sealing inserts, for example, foils, or the screw caps are moulded with special sealing lips which seal onto the cylindrical inside of the bottle head or onto the bottle edge.

Plastics snap closures are also known which also seal onto the inside of the mouth of the bottle. These snap closures are fitted, for example, when dealing with still mineral waters. Known snap lids of this type have a snap edge lying on the outside with a tapered seal lying on the inside. In this case the inside of the cylindrical head of the blank or of the bottle has no curvature along the axis of the cylinder.

Although in this way a seal is obtained with respect to liquids such as, for example, water or the like, with a low degree of capillary action, it is not obtained with respect to methanol or, for example, helium. Helium, as the smallest sized chemical element, is particularly well suited as a measuring medium for testing sealing. If an aseptically sealed closure is desired on a package for flowable media, such measuring methods can be used.

The object of the invention is to provide a package for flowable media of the type described in the introduction, the head of which can be closed in an aseptically sealed manner with the snap lid; and the provision of an injection-moulded blank, as already described hereinabove, from which a package of the type described can be manufactured, wherein the head on the blank is not altered during the process of manufacturing the package.

In accordance with the invention, the object is solved with respect to the package for flowable media in that the head of the package widens radially outwards and upwards at its edge, and both the inner surface of this edge and the outer surface of the sealing lip on the snap lid are curved convexly in the direction of view towards these two surfaces. It is firstly to be explained that the pouring aperture and thereby the head of the package is arranged on the side of the package opposite the base on which it stands, namely "at the top". The free end of the head is thus located at the top, where the edge with the snap catch described is arranged. On the upper free end, the pouring aperture can be closed by means of the snap lid described, which in cross-section has substantially a U-shape, wherein the segment joining the two free legs of the U is the projection onto the closing wall.

Corresponding to the generally circular configuration of the pouring aperture, the closing wall is a flat, round disc which preferably is substantially planar. Onto its annular periphery an outer ring is connected by means of a curve, which ring provides enclosure of the edge of the head. The outer ring can be tilted slightly with respect to the edge of the head, for example, at an angle of 5 to 10°, preferably approximately 20°. At the outer lower end of the outer ring a closure safety device is fitted, which optionally provides retention of the snap lid on the head by means of a catch on the head of the package.

Such a snap lid is clamped onto the edge of the package and can be snapped into place particularly well at its free end in that the head of the package widens outwardly and upwardly. The diameter of the edge is thus on average greater at the upper free end of the head of the package than the diameter of the pouring aperture.

This radial widening of the edge outwards and upwards provides for an inner surface of the edge. Looking towards this, the curvature is convex.

If the snap lid is viewed, and if seen from inside towards its closing wall, the sealing lip is projecting from the closing wall opposite to the direction of viewing, that is to say inwards, is then evident. The diameter of this is determined in relation to the centre of the snap lid from the outer surface of the widening edge of the package head. The edge and the sealing lip should namely be brought into mutual sealing engagement with one another. With this, the outer surface of the sealing lip plays a particular role, and according to the invention it is curved such that it appears convexly curved when viewed at an angle from outside towards the outer surface of the sealing lip. The curvature of the inner surface of the edge on the head and the curvature of the outer surface of the sealing lip on the snap lid are thus curved in opposite directions to one another. These two surfaces come to lie on top of one another when the snap lid closed, and, in accordance with the teaching of the invention, by means of the convex curvatures a sealing line is produced. In other words in cross section along the pouring aperture, the two curved lines touch at a point. This point is the projection of the line which extends along the sealing lip or along the edge of the head. This linear touching allows the aseptically sealed closure of the head with the snap lid described.

Bacteria and spores are generally a magnitude larger than helium atoms and can thus pass through a helium tight seal less than helium atoms. Two criteria have been established for defining aseptic sealing according to the invention: The first criterion requires sealing against helium. The second criterion for an aseptically sealed closure necessitates the sealing surfaces being sterilisable. An aseptically sealed closure within the meaning of the teaching according to the invention is thus a closure sealed at least with respect to methanol, preferably even sealed with respect to helium. This condition is ensured by the solution according to the invention.

It is also particularly advantageous when in addition the sealing surfaces of the aseptically sealed closure can be sterilised well. This is ensured particularly well, inter alia, when the surfaces of both the edge of the head and of the snap lid facing towards the inside of the pouring aperture have surfaces which are as smooth as possible. In accor-

dance with the invention, this is provided in that the surfaces facing towards the inside of the package have no, or almost no, undercuts. The sterilising processes then work particularly well. The skilled person understands that an edge widening radially outwards and upwards on the one hand, and a snap lid with a sealing lip projecting downwards on the other hand make possible smooth surfaces without undercuts.

The sealing between the head of the package and the snap lid is, in the case of the invention, tested by means of two different mechanisms, which will be referred to hereinafter as macrological sealing and micrological sealing. It may be sufficient when the micrological sealing is measured and obtained, for the sealing of a head of a package of the type described here with a snap lid to be described as aseptic.

With the micrological sealing, care is taken that as much compressive strain as possible is concentrated in one point and consequently reliable aseptic sealing occurs at this point and on the corresponding line of maximum compressive strain. In accordance with the invention, series of tests were carried out which showed that a high concentration of strain on just one line of the sealing surface, as described hereinabove, leads to better sealing properties than the distribution of the contact pressure on several bearing lines. By means of the convex curvatures of the sealing surface lying on top of one another, these strain concentrations are advantageously produced on a single line.

In a further advantageous embodiment of the invention, the snap lid is provided on its inside with an annular snap chamfer surrounding the sealing lip, engaging over the edge of the head, and the thickness of the snap lid is smaller in the direction outside and above the snap chamfer than in the area of the outer catch. Where the closing wall of the snap lid terminates outside, and by means of a curvature merges into the outside ring described, there is located internally the snap chamfer, which can engage over the edge of the head, when the snap lid has been pressed onto the head of the package. In precisely this area of transition between the upper closing wall and the lateral outside ring of the snap lid, the thickness of the material is reduced according to the invention such that it is less than the thickness of the material in the area of the outer catch, which—without the head of the package being located between them—lies opposite the outer surface of the sealing lip. In the area of this outer catch and/or in the area of the sealing lip, according to the invention the wall thickness is selected to be greater than in the previously described transition area. Where the thickness of the material is greater, the snap lid has a greater degree of stiffness. If according to the invention in the area outside and above the snap chamfer, that is to say in the wall outside the snap chamfer, the thickness of the material is now reduced, a lesser degree of stiffness is produced, and a line about which, as about an axis, the outer ring of the snap lid can be curved with respect to its closing wall. Again, in cross-section along the pouring aperture, this line of bending is represented as a point about which the outer ring can rotate. In vertical section, in other words, according to the invention a point of rotation is created in the transition area between the closing wall the outer ring of the snap lid, by means of which possibilities for compensating for faulty mouldings of the parts which are to be brought together in sealing engagement are provided, which with conventional closures was unknown until now.

In this way, the second criterion for sealing, that in addition to the micrological, a macrological sealing is provided, can also be satisfied according to the invention. With macrological sealing, larger moulding faults of the snap lid or of the head of the package are compensated for, such as, for example, non-roundness or warping. Between the sealing lip moulded onto the closing wall of the snap lid on the one hand, and the outside catch of the snap lid moulded onto the top of the outer ring on the other hand, the compensating line of rotation is produced (in vertical section, a point of rotation), which gives both the sealing lip and the outside catch enough play to thereby reliably compensate for the possible faults in the snap lid and package head dimensions described. As the snap lid is manufactured from comparatively soft plastics, and the high degree of strength of the material in the area of the outside catch and also in the area of the sealing lip results in a relatively rigid behaviour, the rotation line results from tapering the material in the area described hereinabove. The macrological sealing is responsible, in addition to compensating for faults in dimensions, for the function of providing suitable tensile and compressive forces for the secure seating of the snap lid on the head of the package and for the contact pressure of the sealing lip.

It is furthermore advantageous according to the invention when in cross-section along the pouring aperture, the radius of curvature of the inner surface of the edge of the package head decreases from the inside of the package towards the outside to the free end, thus preferably reduces from infinity to 0.5 mm. Proceeding from the uncurved cylindrical wall facing further towards inside of the package, which thus has an infinitely large radius of curvature, the sealing properties have proved very advantageous when the radius of curvature decreases outwards towards the free end. In a similar manner, it is advantageous when according to the invention in cross-section along the pouring aperture the radius of curvature of the outer surface of the sealing lip on the snap lid is in the region of 0.2 mm to 2 mm. The area with the strongest curvature is thus on the surface where it has a radius of curvature of only 0.2 mm; while the area of the weakest curvature has a radius of preferably approximately 2 mm. According to the invention it is further provided that advantageously the convexly curved inner surface in the area of the edge of the head and the outer surface of the sealing lip convexly curved opposite to this have a low degree of roughness for high surface quality and are configured without raised portions. The manufacturing tools for pouring the blanks when bottles are blown from these, often have mould seams which lie in the mould separation planes. The workpiece produced from this then often has beads, small ribs or knobs which develop as raised portions. In accordance with the invention the manufacturing tool is now configured such that, to the extent that they are needed at all on the tool, such mould seams are not located in the opposite curved surfaces described. In this way smooth sealing surfaces and an optimal sealing are obtained. Advantageously the tools for the manufacture of these convexly curved surfaces can be mirror polished. In this way a high surface quality is obtained, whereby the sealing is further improved.

In order to obtain a good and reliable seal, it is further advantageous when according to the invention the snap lid is composed of a softer thermoplastic material than the head of the package, preferably from amorphous polypropylene. When the package for flowable media is blown from a blank, it is advantageous when this blank is composed, for example, from PET, APET or PETG.

The object of providing an injection moulded blank, with the head of which an aseptically sealed closure by means of a snap lid of the type described hereinabove can be obtained, is solved according to the invention in that the head of the blank is widened radially outwards and upwards at its edge,

and the inner surface of this edge is convexly curved when viewed towards it. Although the purpose of the manufacturing and configuration of the blank according to the invention is also the manufacturing of a package for flowable media, and the aseptically sealed closure thereof with a snap lid. Prior to the manufacture of the package for flowable media itself, there is no need to refer to the snap lid, but nevertheless it is advantageous to comply with the measures described in order to then obtain the same advantages as in connection with the completed package for flowable media. Reference is therefore made to the explanations of the corresponding configuration of the package for flowable media which also apply in the case of the blanks. The configuration and arrangement of the snap lid thus play an important role again, so a corresponding applicability will also be provided for the blank.

In a similar manner, reference is made to the explanations hereinabove for moulding the radii of curvature and the roughness of the surfaces, when it is taken into consideration with the injection moulded blank that according to the invention in cross-section along the pouring aperture the radius of curvature of the inner surface of the edge of the head of the blank decreases from the inside of the blank outwards to the free end, preferably reducing from infinity to 0.5 mm. The same is the case with the advantageous configuration of the injection moulded blank, wherein according to the invention, to obtain a high surface quality, the convexly curved inner surface has, in the area of the edge of the head, a low degree of roughness without raised portions.

As with the package for flowable media itself, the injection moulded blank can be formed from polyethylene terephthalate (PET).

The snap lid, on the other hand, to which reference is made only indirectly, namely with respect to the manufacturing of the package fro flowable media of the type described in the introduction, can be made from the following material:

PP random copolymer type 3300 MC type from BASF
PP random block copolymer type NX 40036 from BASF
PE metallocene type Luflex 1712SX from BASF
LDPE type 1200MN18 from ELFATO
LDPE type 1700MN 18 from ELFATO, and
PP moplen EP-C57MA from Montel.

With the head moulded according to the invention of both the blank and of the package for flowable media of the type described hereinabove, the quantity of material used for aseptically closeable packages can advantageously be reduced. By omitting a thread, the wall thickness of the head can be made thinner. Compared to a conventional blank with a threaded head, which weighs approximately 50 g, with the blank according to the invention, 6 g of PET is saved.

A further advantage of the blank head moulded according to the invention is the functional division into macrological sealing and micrological sealing. In this way large fault tolerances are reliably compensated for, which can occur when the package is moulded. As the bearing point or bearing line of the micrological seal on the curved inner surface of the package head can travel both in the axial and radial direction over a wide area, even large fault tolerances can be reliably compensated for. A typical order of magnitude of fault tolerance which occurs with a package head external diameter of 34 mm is +/–0.1–0.2 mm.

The packages formed using the package head according to the invention can be filled with drinks with a low carbon dioxide content. The internal pressure of a filled package, for example a PET bottle, is advantageously in the range of 1 bar to 4 bar.

Further advantages, features and possibilities for application of the present invention will be evident from the following description of preferred embodiments with reference to the attached drawings. In these is shown in:

FIG. **1** cut away and enlarged, a cross-section view along the pouring aperture, wherein only the hinge side end of the snap lid shown placed in sealing engagement on the head of the package is represented,

FIG. **2** a package for flowable media with the head and snap lid configured according to the invention, wherein the package is represented here as a PET bottle,

FIG. **3** a part of the package head shown cut away and enlarged with the snap lid placed on it according to the detail III in FIG. **2**, and

FIG. **4** an injection moulded blank, which in the upper area has the same configuration as shown enlarged in FIGS. **1** and **3** for the completed blown bottle.

The package for flowable media **1**, in this case a PET bottle, shown in FIG. **2**, has on its upper end a collar shaped head **3** closed with a snap lid **2**. Said head surrounds a pouring aperture **4**. The cross-sectional views in the drawings are taken through the longitudinal central axis **5** of the package for flowable media **1** and of the injection moulded blank **6** according to FIG. **4**. The pouring aperture **4** is surrounded by the annular inner surface **7** arranged inside the head **3**. This can be configured substantially cylindrically in the lower area of the pouring aperture **4**, namely towards the inside of the package **1** and the blank **6**. For reasons of simplicity, in the schematic representation of FIG. **1**, the shape of this inner surface **7** is approximately cylindrical, while this inner surface **7** runs to approximately half height (line **8**) in a tapering manner in the shape of a truncated cone in the embodiments according to FIGS. **2** to **4** in the neck area of the package, that is to say in the area of the head **3**; and thereafter in the direction of the arrow **9** seen further up, above the centre height **8** is configured slightly widening upwards in a truncated cone shape. At the free upper end **10** of the head **3** there is moulded an edge **11** widening radially outwards and upwards—to a greater degree compared to that which has just been described—forming a snap catch **12**. The inner surface **13** of this edge **11** is consequently configured curved upwards and outwards. When viewed in the direction of the normal according to arrow **14** (FIG. **1**) from an angle from above towards this inner surface **13** of the edge **11**, the curvature appears convex. Further, as seen in FIG. **1**, in a direction toward the outer surface of edge **11**, the edge also appears convex.

The head **3** of the package **1** and of the blank **6** is provided on the outside below the edge **11** with a catch **15** which, being a projection delimits the top of an outer groove **16**. The latter is delimited at the bottom by a retaining ring **17** projecting outwards. The same layout is found on both the head **3** of the package for flowable media **1** and the head **3** of the blank **6**.

In the annular outer groove **16** of the head **3** perpendicular to the longitudinal central axis **5** there engages a safety closure **18** for the snap lid **2**. This safety closure **18** forms a visual safety means for the consumer when the package is filled and closed, which indicates the initial opening of the package, in that pre-determined breakage points **19** of the safety closure **18** break when the snap lid is opened for the first time.

Apart from this safety closure **18**, the snap lid **2** generally has the shape of a cup, which is clamped onto the head **3** with the opening facing down, with a U-shaped cross-section. At the top the snap lid **2** then has the substantially planar closing wall **20**. To this, on the outside, an approxi-

mately cylindrical outer ring **21** is connected, which is articulated in a hinged manner opposite to the opening gripper **22**, wherein the hinge is in part only formed by the predetermined breakage points **19**, and does not play any particular role. After repeated opening, the pre-determined breakage points **19** can also break in this area opposite the gripper **22**, so the snap lid **2** can be removed completely after repeated openings.

From the closing wall **20** of the snap lid **2** an annular sealing lip **23** projects towards the interior of the package **1**. The radial outer surface **24** of this sealing lip **23** is configured bulging from the centre radially outwards. The cross-section shown in the cross-sectional representations (along the pouring aperture **4** and the longitudinal central axis **5**) shows a curvature which according to FIGS. **1** to **3** is opposite the curvature of the inner surface **13** of the edge **11**. These are thus opposite curvatures. If viewed in the direction of the arrow **25** (opposite the arrow **14**), in the direction of the normals towards this curved, bulging surface **24** of the sealing lip **23**, it appears convex. The surfaces **13** and **24** are thus opposite, convexly curved surfaces. These two touch each other in the representation of FIGS. **1** to **3** in a point **26**, which is an annular line **26** in the three-dimensional body.

In the transition area between the closing wall **20** and the outer ring **21**, the snap lid **2** is provided with a snap chamfer **27**. Radially outwards and at an angle upwards, the material of the snap lid **2** is configured with a thickness d, which is less than the thickness of the closing wall **20**, with the result that in the snap lid **2** an annular rotation line **28** is produced, which is shown for clarity in FIG. **1** as a point. This point of rotation and the rotation line **28** is an element of the macrological sealing described hereinabove. The snap chamfer **27** makes possible, in cooperation with a bead-shaped outer catch **29** configured below it inside the outer ring **21**, and the snap catch **12** of the head **3**, secure closing of the snap lid **2** on the head **3**. FIG. **1** shows schematically, by means of the imaginary arrow **30** indicating force, the closing force with which the two curved surfaces **13** and **24** are pressed onto one another at the point where they touch (line **26**). These sealing surfaces **13** and **24** are always curved convexly with respect to one another. The bearing point (line **26**), is thus always produced in a precisely defined manner for the micrological sealing also described hereinabove. This line **26** can travel over the curved sealing surfaces **13** and **24** and thereby compensate for dimensional inaccuracies caused by manufacturing faults through heat expansion. During transport and the storage the filled packages are often exposed to different temperatures. Sometimes the packages stand in the blazing sun, another time in a cold store. The micrological sealing of the novel snap closure offers increased protection against leakage in that the bearing line **26** can travel over the curved inner surface **13** of the edge **11**, and thereby can compensate for heat expansion. This also makes possible increased protection from leakage which could result from manufacturing tolerances in the blank **6**, as shown in FIG. **4**, the snap lid **2**, or the package **1** moulded by inflation (PET bottle). Leakages caused by shaking are also optimally prevented in this way.

An inflatable blank **6** with the novel head **3** is shown in FIG. **4**. The inner surface **13** on the edge **11** is moulded with a mirror-polished injection moulding tool. Such tools can be made in particular in that in the area of this inner surface **13** which forms the curved sealing surface of the head **3**, there are no mould seams.

What is claimed is:

1. A package for flowable media and a snap lid (**2**), which package and snap lid are both made from thermoplastic material, in which a collar-shaped head (**3**) of the package surrounds a pouring aperture (**4**) of the package, which collar shaped head has a retaining ring (**17**) on its outside, an inside annular surface (**7**), and an upper end (**10**) having an edge (**11**) with a snap catch (**12**) which upper end is closed by means of the snap lid (**2**), said snap lid (**2**) having a closing wall (**20**) from which an annular sealing lip (**23**) projects towards an inside of the package (**1**), and is brought into contact with an inside surface (**13**) of the edge (**11**) in sealing engagement, said closing wall (**20**) being provided with an outside catch (**29**) for snap engagement with a snap catch (**12**) of the edge (**11**) of the head (**3**) wherein the head (**3**) of the package (**1**) widens outwards and upwards at its edge (**11**), and both the inner surface (**13**) of this edge (**11**) and an outer surface (**24**) of the sealing lip (**23**) on the snap lid (**2**) are curved convexly relative to each other in an engaged and a disengaged position between the lid and the package.

2. A package according to claim **1**, characterised in that the snap lid (**2**) is provided on its inside with an annular snap chamfer (**27**) surrounding the sealing lip (**23**), engaging over the edge (**11**) of the head (**3**), and that the thickness (d) of the snap lid (**2**) is smaller in the direction outside and above the snap chamfer (**27**) than in the area of the outer catch (**29**).

3. A package according to claim **1**, characterised in that in cross-section along the pouring aperture (**4**) the radius of curvature of the inner surface (**13**) of the edge (**11**) of the package head (**3**) decreases from the inside of the package (**1**) outwards to the free end (**10**), preferably reducing from infinity to 0.5 mm.

4. A package according to claim **1**, characterised in that in cross-section along the pouring aperture (**4**) the radius of curvature of the outer surface (**24**) of the sealing lip (**23**) on the snap lid (**2**) is in the range of 0.2 mm to 2 mm.

5. A package according to claim **1**, characterised in that the convexly curved inner surface (**13**) in the area of the edge of the head (**3**) and the convexly curved outer surface (**24**) of the sealing lip (**23**) opposite this have a low degree of roughness to provide a high quality surface, and are configured without raised portions.

6. A package according to claim **1**, characterised in that the snap lid (**2**) is made from a softer thermoplastic material than the head (**3**) of the package (**1**).

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